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THE YEAR-BOOK
FOR
COLORISTS & DYERS

PRESENTING A REVIEW OF THE YEAR'S
ADVANCES IN THE BLEACHING, DYEING,
PRINTING, AND FINISHING OF TEXTILES

BY
HERMAN A. METZ

— —
VOLUME VII
— —

NEW YORK
1904

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PREFACE



THIS, the seventh volume of the Year-Book for Colorists and Dyers, contains a review of the novelties, etc., in reference to dyeing which have appeared during the year 1904. The author trusts that it will be found useful to those interested in this branch of chemical industry.

HERMAN A. METZ.

122 HUDSON STREET, NEW YORK CITY, March, 1905.

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PART I

Reference Tables



Reference Tables

THE METRIC SYSTEM, WITH EQUIVALENTS.

The entire metric system of weights and measures is based upon a fundamental unit called a meter, which is the ten-millionth part of the distance from the equator to the pole, and is the principal unit of linear measure.

The ARE, or unit of square measure, is a square whose side is 10 meters.

The STERE, or unit of cubic measure, is a cube whose edge is a meter.

The LITER, or unit of all measures of capacity, is a cube whose edge is the tenth of a meter.

The GRAM or unit of weight, is the weight of a cube of pure water at its greatest density, the edge of which is the hundredth part of a meter.

Elements of the System.

Length.	Surface.	Capacity.	Weight.	Notation.
Myriameter. Kilometer. Hectometer. Decameter.	Hectare. Decare.	Kiloliter. Hectoliter. Decaliter.	Metric ton. Quintal. Myriagram. Kilogram. Hectogram. Decagram.	1,000,000 100,000 10,000 1,000 100 10
<i>Meter.</i> Decimeter. Centimeter. Millimeter.	<i>Are.</i> Centiare.	<i>Liter.</i> Deciliter. Centiliter. Milliliter.	<i>Gram.</i> Decigram. Centigram. Milligram.	1 .1 .01 .001

Year-Book for Colorists and Dyers

Linear, or Long Measure.

	Meters.	Inches.	Feet.	Yards.	Miles.
Millimeter .....	.001	.03937	.00328	.00109	.....
Centimeter .....	.01	.3937	.03280	.01093	.....
Decimeter .....	.1	3.937	.32808	.10936	.00066
Meter	1.	¹ 39.37	3.28083	1.093611	.00062
Decameter	10	.....	32.80833	10.93611	.00621
Hectometer	100	.....	328.0833	109.3611	.06213
Kilometer	1,000	.....	3280.833	1093.611	.62137
Myriameter	10,000	.....	.....	.....	6.2137

¹ 39.37 inches is the legalized equivalent of the meter in the United States. The exact equivalent is 39.37079 inches.

Square Measure.

	Square Meters.	Square Inches.	Square Feet.	Square Yards.	Acres.
Milliare .....	.1	155	1.0764	.1196	.....
Centiare, or square meter ..	1	1550	10.764	1.196	.....
Deciare	10	.....	107.64	11.96	.0024
Are, or square decameter ..	100	.....	1076.4	119.6	.0247
Decare	1,000	.....	.....	1196	.2471
Hectare	10,000	.....	.....	.....	2.471

A square centimeter equals 0.155 square inches, a square decimeter 15.5 square inches, and a square kilometer 0.386 square miles.

Cubic Measure.

	Cubic Meters.	Cubic Inches.	Cubic Feet.	Cubic Yards.
Millistere, or cubic decimeter .....	.001	61.023	.035314	.....
Centistere .....	.01	610.23	.35314	.01308
Decistere .....	.1	.....	3.5314	.1308
Stere, or cubic meter	1	.....	35.314	1.308
Decastere	10	.....	353.14	13.08
Hectostere	100	.....	.....	130.8

Reference Tables

Measure of Capacity.

	Liters.	Fluid Ounces.	Quarts.	Gallons.	Bushels.
Milliliter, or cubic centimeter.....	.001	.0338	.00106	.....	.....
Centiliter .....	.01	.338	.01057	.00264	.....
Deciliter .....	.1	3.38	.10567	.02642	.002838
Liter, or cubic decimeter	1	33.8	1.0567	.26417	.028377
Decaliter	10	338	10.567	2.6417	.283774
Hectoliter	100	.....	105.67	26.417	2.83774
Kiloliter	1,000	.....	.....	264.17	28.3774
Myrialiter	10,000	.....	.....	2641.7	283.774

A liter of water at its maximum density weighs a kilogram.

Weight.

	Grams.	Grains.	Ounces Avoir- dupois.	Pounds Avoir- dupois.	Tons of 2240 Pounds.
Milligram .....	.001	.01543	.....	.....	.....
Centigram .....	.01	.15432	.....	.....	.....
Decigram .....	.1	1.54324	.0035	.....	.....
Gram	1	15.43236	.0353	.0022	.....
Decagram	10	154.32356	.3527	.0220	.....
Hectogram	100	1,543.23564	3.5274	.22046	.....
Kilogram	1,000	15,432.35639	35.274	2.20462	.000984
Myriagram	10,000	.....	.....	22.0462	.009842
Quintal	100,000	.....	.....	220.462	.09842
Millier, or tonneau.	1,000,000	.....	.....	2204.62	.9842

COMPARISON OF METRIC SYSTEM WITH THE UNITED STATES METHOD OF WEIGHTS AND MEASURES.

(Arranged in Alphabetical Order.)

Are (100 square meters)=119.6 square yards.

Bushel=2150.42 cubic inches, 35.24 liters.

Centare (1 square meter)=1550 square inches.

Centigram (1/100 gram)=0.1543 grain.

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Centiliter (1/100 liter) = 2.71 fluid drams, 0.338 fluid ounce.

Centimeter (1/100 meter) = 0.3937 inch.

1 Cubic centimeter = 16.23 minims (Apothecaries).

10 Cubic centimeters = 2.71 fluid drams (Apothecaries).

30 Cubic centimeters = 1.01 fluid ounces (Apothecaries).

100 Cubic centimeters = 3.38 fluid ounces (Apothecaries).

473 Cubic centimeters = 16.00 fluid ounces (Apothecaries).

500 Cubic centimeters = 16.90 fluid ounces (Apothecaries).

1000 Cubic centimeters = 33.81 fluid ounces (Apothecaries).

Decigram (1/10 gram) = 1.5432 grains.

Decimeter (1/10 meter) = 3.937 inches.

Deciliter (1/10 liter) = 0.845 gill.

Dekagram (10 grams) = 0.3527 ounce.

Dekaliter (10 liters) = 9.08 quarts (dry), 2.6418 gallons.

Dekameter (10 meters) = 393.7 inches.

Dram (Apothecaries or Troy) = 3.9 grams.

Foot = 0.3048 meter, or 30.48 centimeters.

Gallon = 3.785 liters.

Gill = 0.118295 liter, or 142 cubic centimeters.

Grain (Troy) = 0.064804 gram.

Grain = 0.0648.

Gram = 15.432 grains.

Hectare (10,000 square meters) = 2.471 acres.

Hectogram = 3.5274 ounces.

Hectoliter (100 liters) = 2.838 bushels, or 26.418 gallons.

Hectometer (100 meters) = 328 feet 1 inch.

Hundredweight (112 pounds Avoirdupois) = 50.8 kilograms.

Inch = 0.0254 meter.

Inch = 2.54 centimeters.

Inch = 25.40 millimeters.

Kilogram = 2.2046 pounds, or 35.274 ounces.

Kiloliter (1000 liters) = 1.308 cubic yards, or 264.18 gallons.

Kilometer (1000 meters) = 0.62137 mile (3280 feet 10 inches).

Liter = 1.0567 quarts, 0.264 gallon (liquid), or 0.908 quart (dry).

Meter = 39.3700 inches, or 3.28083 feet.

Reference Tables

Mile = 1.609 kilometers.

Mile = 5280 feet, or 1609.3 meters.

Millier or tonneau = 2204.6 pounds.

Milligram = 0.0154 grain.

Millimeter ($1/1000$ meter) = 0.0394 inch.

Myriagram = 22.046 pounds.

Myriameter (10,000 meters) = 6.2137 miles.

Ounce (Avoirdupois) = 28.350 grams.

Ounce (fluid) = 28.3966 cubic centimeters.

Ounce (Troy or Apothecaries) = 31.104 grams.

Peck = 9.08 liters.

Pint (liquid) = 0.47318 liter.

Pound (Avoirdupois) = 453.603 grams.

Pound (English) = 0.453 kilogram.

Pound (Troy) = 373.25 grams.

Quart (liquid) = 0.94636 liter.

Quintal = 220.46 pounds.

Seruple (Troy) = 1.296008 grams.

Ton = 20 hundredweight = 2240 pounds (Avoirdupois) 1016.070 kilograms.

Yard = 0.9144 meter.

TABLE OF MULTIPLES.

Centimeters \times 0.3937 = inches.

Centimeters \times 0.0328 = feet.

Centimeters, cubic, \times 0.0338 = apothecaries' fluid ounces.

Diameter of a circle \times 3.1416 = circumference.

Gallons \times 3.785 = liters.

Gallons \times 0.833565 = imperial gallons.

Gallons, imperial, \times 1.199666 = U. S. gallons.

Gallons \times 8.33505 = pounds of water.

Gallons, imperial, \times 10 = pounds of water.

Gallons, imperial, \times 4.54102 = liters.

Grains \times 0.0648 = grams.

Inches \times 0.0254 = meters.

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Inches $\times 25.4 =$ millimeters.

Miles $\times 1.609 =$ kilometers.

Ounces, Troy, $\times 1.097 =$ ounces of avoirdupois.

Ounces, avoirdupois, $\times 0.9115 =$ ounces Troy.

Pounds, avoirdupois, $\times 0.4536 =$ kilograms.

Pounds, avoirdupois, $\times 0.8228572 =$ pounds Troy.

Pounds, Troy, $\times 0.37286 =$ kilograms.

Pounds, Troy, $\times 1.21527 =$ pounds avoirdupois.

Radius of a circle $= 6.283185 \times$ circumference.

Square of the radius $\times 3.1416 =$ area.

Square of the circumference of a circle $\times 0.07958 =$ area.

MISCELLANEOUS MEASURES.

Barrel of flour $= 196$ pounds.

Barrel of salt $= 280$ pounds.

Bale of cotton (in America) $= 400$ pounds.

Bale of cotton (in Egypt) $= 90$ pounds.

Bag of Sea Island cotton $= 300$ pounds.

Cable $= 120$ fathoms.

Can $= 35$ pounds.

Cask of lime $= 240$ pounds.

Fathom $= 6$ feet.

Hand $= 4$ inches.

Hogshead $= 63$ gallons.

Keg (nails) $= 100$ pounds.

Noggin or Nog. $= \frac{5}{8}$ of a pint.

Pace $= 3.3$ feet.

Palm $= 3$ inches.

Pipe $= 2$ hogsheads.

Stone $= 14$ pounds.

Tun $= 2$ pipes.

Cubic foot of water weighs 62.4 pounds.

Cubic foot of water is 7.48 gallons.

Gallon of water weighs $8\frac{1}{2}$ pounds.

Gallon of water is 231 cubic inches.

Reference Tables

In England, wool is sold by the sack, or boll, of 22 stones, which, at 14 pounds to the stone, is 308 pounds.

A pack of wool is 17 stones and 2 pounds, which is rated as a pack load for a horse. It is 240 pounds.

Sack of flour = 280 pounds.

A tod of wool is 2 stones of 14 pounds.

A wey of wool is $6\frac{1}{4}$ tods. Two weys, a sack.

A clove of wool is half a stone.

THERMOMETRY.

Fahr.	Cent.	Fahr.	Cent.	Fahr.	Cent.
—10	—23.33	13	—10.56	36	2.22
—9	—22.78	14	—10.00	37	2.78
—8	—22.22	15	—9.44	38	3.33
—7	—21.67	16	—8.89	39	3.89
—6	—21.11	17	—8.33	40	4.44
—5	—20.56	18	—7.78	41	5.00
—4	—20.00	19	—7.22	42	5.56
—3	—19.44	20	—6.67	43	6.11
—2	—18.89	21	—6.11	44	6.67
—1	—18.33	22	—5.56	45	7.22
0	—17.78	23	—5.00	46	7.78
1	—17.22	24	—4.44	47	8.33
2	—16.67	25	—3.89	48	8.89
3	—16.11	26	—3.33	49	9.44
4	—15.56	27	—2.78	50	10.00
5	—15.00	28	—2.22	51	10.56
6	—14.44	29	—1.67	52	11.11
7	—13.89	30	—1.11	53	11.67
8	—13.33	31	—0.56	54	12.22
9	—12.78	32	—0.00	55	12.78
10	—12.22	33	0.56	56	13.33
11	—11.67	34	1.11	57	13.89
12	—11.11	35	1.67	58	14.44

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Fahr.	Cent.	Fahr.	Cent.	Fahr.	Cent.
59	15.00	93	33.89	127	52.78
60	15.66	94	34.44	128	53.34
61	16.11	95	35.00	129	53.89
62	16.67	96	35.56	130	54.45
63	17.22	97	36.11	131	55.00
64	17.78	98	36.67	132	55.56
65	18.33	99	37.22	133	56.12
66	18.89	100	37.78	134	56.67
67	19.44	101	38.34	135	57.23
68	20.00	102	38.89	136	57.78
69	20.56	103	39.45	137	58.34
70	21.11	104	40.00	138	58.89
71	21.67	105	40.56	139	59.45
72	22.22	106	41.12	140	60.00
73	22.78	107	41.67	141	60.56
74	23.33	108	42.23	142	61.12
75	23.89	109	42.78	143	61.67
76	24.44	110	43.34	144	62.23
77	25.00	111	43.89	145	62.78
78	25.56	112	44.45	146	63.34
79	26.11	113	45.00	147	63.89
80	26.67	114	45.56	148	64.45
81	27.22	115	46.22	149	65.00
82	27.78	116	46.67	150	65.56
83	28.33	117	47.23	151	66.12
84	28.89	118	47.78	152	66.67
85	29.44	119	48.34	153	67.23
86	30.00	120	48.89	154	67.78
87	30.56	121	49.45	155	68.34
88	31.11	122	50.00	156	68.89
89	31.67	123	50.56	157	69.45
90	32.22	124	51.12	158	70.00
91	32.78	125	51.67	159	70.56
92	33.33	126	52.23	160	71.12

Reference Tables

Fahr.	Cent.	Fahr.	Cent.	Fahr.	Cent.
161	71.67	195	90.56	229	109.44
162	72.23	196	81.12	230	110.00
163	72.78	197	91.67	231	110.55
164	73.34	198	92.23	232	111.11
165	73.89	199	92.78	233	111.67
166	74.45	200	93.34	234	112.22
167	75.00	201	93.89	235	112.78
168	75.56	202	94.44	236	113.33
169	76.12	203	95.00	237	113.89
170	76.67	204	95.55	238	114.44
171	77.23	205	96.11	239	115.00
172	77.78	206	96.67	240	115.55
173	78.34	207	97.22	241	116.11
174	78.89	208	97.78	242	116.67
175	79.45	209	98.33	243	117.22
176	80.00	210	98.89	244	117.78
177	80.56	211	99.44	245	118.33
178	81.12	212	100.00	246	118.89
179	81.67	213	100.55	247	119.44
180	82.23	214	101.11	248	120.00
181	82.78	215	101.67	249	120.55
182	83.34	216	102.22	250	121.11
183	83.89	217	102.78	251	121.67
184	84.45	218	103.33	252	122.22
185	85.00	219	103.89	253	122.78
186	85.56	220	104.44	254	123.33
187	86.12	221	105.00	255	123.89
188	86.67	222	105.55	256	124.44
189	87.23	223	106.11	257	125.00
190	87.78	224	106.67	258	125.55
191	88.34	225	107.22	259	126.11
192	88.89	226	107.78	260	126.67
193	89.45	227	108.33	261	127.22
194	90.00	228	108.89	262	127.78

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Fahr.	Cent.	Fahr.	Cent.	Fahr.	Cent.
263	128.33	264	128.89	266	130.00
		265	129.44		

A method to transform Fahrenheit to Centigrade, or *vice versa*, is the formula:

$$\frac{C \times 9}{5} + 32 \text{ equals Fahrenheit.}$$

$$F - 32 \times \frac{5}{9} \text{ equals Centigrade.}$$

Comparison Between the Scales of Fahrenheit, Réaumur, and the Centigrade.

(Zero Fahrenheit corresponds with minus 17.78 Centigrade and minus 14.22 Réaumur.)

Cent.	Fahr.	Rmr.			
100	212	80	81	177.8	64.8
99	210.2	79.2	80	176	64.
98	208.4	78.4	79	174.2	63.2
97	206.6	77.6	78	172.4	62.4
96	204.8	76.8	77	170.6	61.6
95	203	76	76	168.8	60.8
94	201.2	75.2	75	167	60
93	199.4	74.4	74	165.2	59.2
92	197.6	73.6	73	163.4	58.4
91	195.8	72.8	72	161.6	57.6
90	194	72	71	159.8	56.8
89	192.2	71.2	70	158	56
88	190.4	70.4	69	156.2	55.2
87	188.6	69.6	68	154.4	54.4
86	186.8	68.8	67	152.6	53.6
85	185	68	66	150.8	52.8
84	183.2	67.2	65	149	52
83	181.4	66.4	64	147.2	51.1
82	179.6	65.6	63	145.4	50.4
			62	143.6	49.6

Reference Tables

Cent.	Fahr.	Rmr.	Cent.	Fahr.	Rmr.
61	141.8	48.8	27	80.6	21.6
60	140	48	26	78.8	20.8
59	138.2	47.2	25	77	20
58	136.4	36.4	24	75.2	1.2
57	134.6	45.6	23	73.4	18.4
56	132.8	44.8	22	71.6	17.6
55	131	44	21	69.8	16.8
54	129.2	43.2	20	68	16
53	127.4	42.4	19	66.2	15.2
52	125.6	41.6	18	64.4	14.4
51	123.8	40.8	17	62.6	13.6
50	122	40	16	60.8	12.8
49	120.2	39.2	15	59	12
48	118.4	38.4	14	57.2	11.2
47	116.6	37.6	13	55.4	10.4
46	114.8	36.8	12	53.6	9.6
45	113	36	11	51.8	8.8
44	111.2	35.2	10	50	8
43	109.4	34.4	9	48.2	7.2
42	107.6	33.6	8	46.4	6.4
41	105.8	32.8	7	44.6	5.6
40	104	32	6	42.8	4.8
39	102.2	31.2	5	41	4
38	100.4	30.4	4	39.2	3.2
37	98.6	29.6	3	37.4	2.4
36	96.8	28.8	2	35.6	1.6
35	95	28	1	33.8	0.8
34	93.2	27.2	Zero	32	Zero
33	91.4	26.4	—1	30.2	—0.8
32	89.6	25.6	—2	28.4	—1.6
31	87.8	24.8	—3	26.6	—2.4
30	86	24	—4	24.8	—3.2
29	84.2	23.2	—5	23	—4
28	82.4	22.4	—6	21.2	—4.8

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Cent.	Fahr.	Rmr.	Cent.	Fahr.	Rmr.
—7	19.4	—5.6	—29	—20.2	—23.2
—8	17.6	—6.4	—30	—22	—24
—9	15.8	—7.2	—31	—23.8	—24.8
—10	14	—8	—32	—25.6	—25.6
—11	12.2	—8.8	—33	—27.4	—26.4
—12	10.4	—9.6	—34	—29.2	—27.2
—13	8.6	—10.4	—35	—31	—28
—14	6.8	—11.2	—36	—32.8	—28.8
—15	5	—12	—37	—34.6	—29.6
—16	3.2	—12.8	—38	—36.4	—30.44
—17	1.4	—13.6	—39	—38.2	—31.2
—18	—	—14.4	—40	—40	—32
—19	—2.2	—15.2	—41	—41.8	—32.8
—20	—4	—16	—42	—43.6	—33.6
—21	—5.8	—16.8	—43	—45.4	—34.4
—22	—7.6	—17.6	—44	—47.2	—35.2
—23	—9.4	—18.4	—45	—49	—36
—24	—11.2	—19.2	—46	—50.8	—36.8
—25	—13	—20	—47	—52.6	—37.6
—26	—14.8	—20.8	—48	—54.4	—38.4
—27	—16.6	—21.6	—49	—56.2	—39.2
—28	—18.4	—22.4			



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TO CHANGE FROM TWADDLE SCALE TO SPECIFIC GRAVITY, OR FROM GRAVITY TO TWADDLE SCALE.

In order to change degrees Twaddle into specific gravity, multiply by 5, add 1000, and divide by 1000. Example: Change 168° Twaddle into specific gravity.

$$\begin{array}{r} 168 \times 5 \\ \hline 840 \\ 1,000 \\ \hline 1,000 \overline{) 1.840} \\ \hline 1.84 \text{ Spec. Grav.} \end{array}$$

To change specific gravity into degrees Twaddle, multiply by 1000, subtract 1000, and divide by 5. Example: Change 1.84 specific gravity into degrees Twaddle.

$$\begin{array}{r} 1.84 \times 1,000 \\ \hline 1,840 \\ 1,000 \\ \hline 5 \overline{) 840} \\ \hline 168^\circ \text{ Tw.} \end{array}$$

The degrees of Twaddle's hydrometer are easily turned into specific gravity numbers—a quality which makes it preferable to any other hydrometer in use. The rule is to multiply the indicated degree by 5, and add 1000 to the product; for example, 9 degrees Twaddle equals specific gravity 1045; 25 degrees Twaddle equals specific gravity 1125; 100 degrees Twaddle equals specific gravity 1500; and so on. To bring specific gravity numbers to degrees of Twaddle, subtract 1000, and divide the remainder by 5; for example: specific gravity 1000 degrees equals 20 degrees Twaddle.

Reference Tables

If the sample is too viscous to determine the density directly, a weighed portion of it can be first diluted with a weighed quantity of water, or a weighed portion can be dissolved and diluted to a known volume with water. In the first instance the per cent. of total solids is to be calculated by the following formula:

$$\text{Per cent. of solids in the undiluted material} = \frac{WS}{w}.$$

S = per cent. of solids in the diluted material.

W = weight of the diluted material.

w = weight of the sample taken for dilution.

If the dilution was made to a definite volume, the following formula is to be used:

$$\text{Per cent. of solids in the undiluted material} = \frac{VDS}{w}.$$

V = volume of the diluted solution.

D = specific gravity of the diluted solution.

S = per cent. of solids in the diluted solution.

w = weight of the sample taken for dilution.

To reduce a liquid to a desired specific gravity:

Let v equal the volume of the first liquid.

Let B equal the Beaumé of the first liquid.

Let b equal the Beaumé of the second or reducing liquid.

Let a equal the Beaumé required.

Let z equal the volume of the reducing liquid.

$$z = \frac{av - vB}{b - a}.$$

SULPHURIC ACID.

The Manufacturing Chemists' Association have adopted the following figures as representing the per cent. of H_2SO_4 in an oil of vitriol. Since colorists rarely or never need to look up an acid

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below 80 per cent. oil of vitriol, the table only goes to that degree.

Beaumé.	Sp. Gr.	H ₂ SO ₄ .	Oil Vitrol.
66	1.835	93.50	100
65	1.814	88.82	95
64	1.793	86.30	92
63	1.775	84.50	89
62	1.767	83.21	87
61	1.727	79.47	85
60	1.705	77.60	83
59	1.683	75.73	81

SPECIFIC GRAVITY OF ACETIC ACID SOLUTIONS 15° C.

Specific Gravity.	Per cent.	Specific Gravity.	Per cent.
1.0007	1	1.0256	18
1.0022	2	1.0270	19
1.0037	3	1.0284	20
1.0052	4	1.0298	21
1.0067	5	1.0311	22
1.0083	6	1.0324	23
1.0098	7	1.0337	24
1.0113	8	1.0350	25
1.0127	9	1.0363	26
1.0142	10	1.0375	27
1.0157	11	1.0388	28
1.0171	12	1.0400	29
1.0185	13	1.0412	30
1.0200	14	1.0424	31
1.0214	15	1.0436	32
1.0228	16	1.0447	33
1.0242	17	1.0459	34

Reference Tables

Specific Gravity.	Per cent.	Specific Gravity.	Per cent.
1.0470	35	1.0725	68
1.0481	36	1.0729	69
1.0492	37	1.0733	70
1.0502	38	1.0737	71
1.0513	39	1.0740	72
1.0523	40	1.0742	73
1.0533	41	1.0744	74
1.0543	42	1.0746	75
1.0552	43	1.0747	76
1.0562	44	1.0748	77
1.0571	45	1.0748	78
1.0580	46	1.0748	79
1.0589	47	1.0748	80
1.0598	48	1.0747	81
1.0607	49	1.0746	82
1.0615	50	1.0744	83
1.0623	51	1.0742	84
1.0631	52	1.0739	85
1.0638	53	1.0736	86
1.0646	54	1.0731	87
1.0653	55	1.0726	88
1.0660	56	1.0720	89
1.0666	57	1.0713	90
1.0673	58	1.0705	91
1.0679	59	1.0696	92
1.0685	60	1.0686	93
1.0691	61	1.0674	94
1.0697	62	1.0660	95
1.0702	63	1.0644	96
1.0707	64	1.0625	97
1.0712	65	1.0604	98
1.0717	66	1.0580	99
1.0721	67	1.0553	100

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NOTE.—The specific gravity 1.0553 may indicate either of two solutions of different strengths. To determine whether an acid is stronger than 78 per cent. (the maximum specific gravity) some water is added; if the specific gravity rises it is stronger, if it falls it is weaker than 78 per cent. acid.

SPECIFIC GRAVITY OF HYDROCHLORIC ACID SOLUTIONS.

Specific Gravity.	Degrees Beaumé.	Per cent. HCl.
1.005	0.7	1.15
1.010	1.4	2.14
1.015	2.1	3.12
1.020	2.7	4.13
1.025	3.4	5.15
1.030	4.1	6.15
1.035	4.7	7.15
1.040	5.4	8.16
1.045	6.0	9.16
1.050	6.7	10.17
1.055	7.4	11.18
1.060	8.0	12.19
1.065	8.7	13.19
1.070	9.4	14.17
1.075	10.0	15.16
1.080	10.6	16.15
1.085	11.2	17.13
1.090	11.9	18.11
1.095	12.4	19.06
1.100	13.0	20.01
1.105	13.6	20.97
1.110	14.2	21.92
1.115	14.9	22.86
1.120	15.4	23.82
1.125	16.0	24.78

Reference Tables

Specific Gravity.	Degrees Beaumé.	Per cent. HCl.
1.130	16.5	25.75
1.135	17.1	26.70
1.140	17.7	27.66
1.1425	18.0	28.14
1.145	18.3	28.61
1.150	18.8	29.57
1.152	19.0	29.95
1.155	19.3	30.55
1.160	19.8	31.52
1.163	20.0	32.10
1.165	20.3	32.49
1.170	20.9	33.46
1.171	21.0	33.65
1.175	21.4	34.42
1.180	22.0	35.39
1.185	22.5	36.31
1.190	23.0	37.23
1.195	23.5	38.16
1.200	24.0	39.11

FORMALDEHYDE—SPECIFIC GRAVITY OF SOLUTIONS.

Specific Gravity at 15.6°C.	Per cent. by Weight.	Per cent. by Volume.
1.0025	1.0	1.0
1.0125	5.0	5.0
1.0250	10.0	10.25
1.0380	15.0	15.6
1.0530	20.0	21.1
1.0670	25.0	26.7
1.0830	30.0	32.5
1.1040	35.0	38.6
1.1250	40.0	45.0

This table is by W. A. Davis, in the Journal of Society of Chemical Industry, 1897, 502.

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BLEACHING POWDER (CALCIUM HYPOCHLORITE) SOLUTIONS—STRENGTH AND SPECIFIC GRAVITY AT 15° C.

Specific Gravity.	Degrees Bé.	Per cent. Available Cl.
1.008	1	0.5
1.015	2	1.0
1.023	3	1.5
1.030	4	2.0
1.037	5	2.5
1.045	6	3.0
1.053	7	3.5
1.060	8	4.0
1.069	9.2	4.5
1.078	10.4	5.0
1.087	11.5	5.5
1.097	12.6	6.0
1.105	13.6	6.4

CALCIUM ACETATE SOLUTIONS—SPECIFIC GRAVITY AT 15° C.

Specific Gravity.	Degrees Bé.	Per cent. $\text{Ca}(\text{C}_2\text{H}_3\text{O}_2)_2$
1.0260	3.4	5
1.0530	7.1	10
1.0792	10.5	15
1.1051	13.6	20
1.1321	16.8	25
1.1594	19.8	30

NITRIC ACID—SPECIFIC GRAVITY AND STRENGTH OF SOLUTIONS AT 0° C.

Specific Gravity.	Degrees Bé.	Per cent. HNO_3	Per cent. N_2O_5
1.007	1	1.1	0.9
1.014	2	2.2	1.9

Reference Tables

Specific Gravity.	Degrees Bé.	Per cent. HNO_3 .	Per cent. N_2O_5 .
1.022	3	3.4	2.9
1.029	4	4.5	3.9
1.036	5	5.5	4.7
1.044	6	6.7	5.7
1.052	7	8.0	6.9
1.060	8	9.2	7.9
1.067	9	10.2	8.7
1.075	10	11.4	9.8
1.083	11	12.6	10.8
1.091	12	13.8	11.8
1.100	13	15.2	13.0
1.108	14	16.4	14.0
1.116	15	17.6	15.1
1.125	16	18.9	16.2
1.134	17	20.2	17.3
1.143	18	21.6	18.5
1.152	19	22.9	19.6
1.161	20	24.2	20.7
1.171	21	25.7	22.0
1.180	22	27.0	23.1
1.190	23	28.5	24.4
1.199	24	29.8	25.5
1.210	25	31.4	26.9
1.221	26	33.1	28.4
1.231	27	34.6	29.7
1.242	28	36.2	31.0
1.252	29	37.7	32.3
1.261	30	39.1	33.5
1.275	31	41.1	35.2
1.286	32	42.6	36.5
1.298	33	44.4	38.0
1.309	34	46.1	39.5
1.321	35	48.0	41.1

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Specific Gravity.	Degrees Bé.	Per cent. HNO ₃ .	Per cent. N ₂ O ₅ .
1.334	36	50.0	42.9
1.346	37	51.9	44.5
1.359	38	54.0	46.3
1.372	39	56.2	48.2
1.384	40	58.4	50.0
1.398	41	60.8	52.1
1.412	42	63.2	54.2
1.426	43	66.2	56.7
1.140	44	69.0	59.1
1.454	45	72.2	61.9
1.470	46	76.1	65.2
1.485	47	80.2	68.7
1.501	48	84.5	72.4
1.516	49	88.4	75.8
1.524	49.5	90.5	77.6
1.532	50	92.7	79.5
1.541	50.5	95.0	81.4
1.549	51	97.3	83.4
1.559	51.5	100.0	85.7

ALUMINIUM ACETATE SOLUTIONS—STRENGTH AND SPECIFIC GRAVITY AT 17° C.

Specific Gravity.	Degrees Bé.	Per cent. Al ₂ O ₃ .
1.012	1.6	0.5
1.025	3.4	1.0
1.038	5.0	1.5
1.050	6.7	2.0
1.062	8.3	2.5
1.074	9.9	3.0
1.086	11.3	3.5
1.098	12.8	4.0
1.100	13.0	4.5

Reference Tables

ALUMINIUM NITRO-ACETATE SOLUTIONS—SPECIFIC GRAVITY AND STRENGTH AT 17° C.

Specific Gravity.	Degrees Bé.	Per cent. Al_2O_3 .
1.012	1.6	0.5
1.025	3.4	1.0
1.039	5.3	1.5
1.054	7.2	2.0
1.068	9.1	2.5
1.083	11.0	3.0
1.097	12.7	3.5
1.112	14.4	4.0
1.126	16.1	4.5
1.141	17.8	5.0
1.156	19.4	5.5
1.160	19.8	5.64

ALUMINIUM SULPHATE SOLUTIONS—STRENGTH AND SPECIFIC GRAVITY AT 15° C.

Specific Gravity.	Per cent. $\text{Al}_2(\text{SO}_4)_3$.	Specific Gravity.	Per cent. $\text{Al}_2(\text{SO}_4)_3$.
1.0170	1	1.1467	14
1.0270	2	1.1574	15
1.0370	3	1.1668	16
1.0470	4	1.1770	17
1.0569	5	1.1876	18
1.0670	6	1.1971	19
1.0768	7	1.2074	20
1.0870	8	1.2168	21
1.0968	9	1.2274	22
1.1071	10	1.2375	23
1.1171	11	1.2473	24
1.1270	12	1.2573	25
1.1369	13		

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ALUMINIUM CHLORIDE SOLUTIONS—STRENGTH AND SPECIFIC GRAVITY AT 15° C.

Specific Gravity.	Per cent. Al_2Cl_6 .	Specific Gravity.	Per cent. Al_2Cl_6 .
1.00721	1	1.17092	22
1.01443	2	1.17953	23
1.02164	3	1.18815	24
1.02885	4	1.19676	25
1.03603	5	1.20584	26
1.04353	6	1.21493	27
1.05099	7	1.22406	28
1.05845	8	1.23310	29
1.06591	9	1.24219	30
1.07337	10	1.25184	31
1.08120	11	1.26149	32
1.08902	12	1.27115	33
1.09684	13	1.28080	34
1.10466	14	1.29046	35
1.11248	15	1.30066	36
1.12073	16	1.31086	37
1.12897	17	1.32106	38
1.13721	18	1.33126	39
1.14545	19	1.34146	40
1.15370	20	1.35224	41
1.16231	21	1.35359	41.126

SODA SOLUTIONS—SPECIFIC GRAVITY AT 15° C.

Specific Gravity.	Degree Bé.	Per cent. by Weight.	
		Na_2CO_3	$\text{Na}_2\text{CO}_3 + 10\text{H}_2\text{O}$.
1.007	1	0.67	1.807
1.014	2	1.33	3.587
1.022	3	2.09	5.637
1.029	4	2.76	7.444
1.036	5	3.43	9.251

Reference Tables

Specific Gravity.	Degree Be.	Per cent. by Weight.	
		Na_2CO_3	$\text{Na}_2\text{CO}_3 + 10\text{H}_2\text{O}$.
1.045	6	4.29	11.570
1.052	7	4.94	13.323
1.060	8	5.71	15.400
1.067	9	6.37	17.180
1.075	10	7.12	19.203
1.083	11	7.88	21.252
1.091	12	8.62	23.248
1.100	13	9.43	25.432
1.108	14	10.19	27.482
1.116	15	10.95	29.532
1.125	16	11.81	31.851
1.134	17	12.61	34.009
1.142	18	13.16	35.493
1.152	19	14.24	38.405

GLAUBER'S SALT SOLUTIONS (SODIUM SULPHATE CRYSTALS)—SPECIFIC GRAVITY AT 19° C.

Specific Gravity.	Per cent.	
	$\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$.	Na_2SO_4 .
1.0040	1	0.441
1.0079	2	0.881
1.0118	3	1.323
1.0158	4	1.764
1.0198	5	2.205
1.0238	6	2.646
1.0278	7	3.087
1.0318	8	3.528
1.0358	9	3.969
1.0398	10	4.410
1.0439	11	4.851
1.0479	12	5.292
1.0520	13	5.733
3	33	

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Specific Gravity.	$\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}.$	Per cent.	$\text{Na}_2\text{SO}_4.$
1.0560	14		6.174
1.0601	15		6.615
1.0642	16		7.056
1.0683	17		7.497
1.0725	18		7.938
1.0766	19		8.379
1.0807	20		8.820
1.0849	21		9.261
1.0890	22		9.702
1.0931	23		10.143
1.0973	24		10.584
1.1015	25		11.025
1.1057	26		11.466
1.1100	27		11.907
1.1142	28		12.348
1.1184	29		12.789
1.1226	30		13.230

COMMON SALT SOLUTIONS—SPECIFIC GRAVITY AT 15° C.

Specific Gravity.	Per cent. NaCl.	Specific Gravity.	Per cent. NaCl.
1.00725	1	1.08859	12
1.01450	2	1.09622	13
1.02174	3	1.10384	14
1.02899	4	1.11146	15
1.03624	5	1.11938	16
1.04366	6	1.12730	17
1.05108	7	1.13523	18
1.05851	8	1.14315	19
1.06593	9	1.15107	20
1.07335	10	1.15931	21
1.08097	11	1.16755	22

Reference Tables

Specific Gravity.	Per cent. NaCl.	Specific Gravity.	Per cent. NaCl.
1.17580	23	1.19228	25
1.18404	24	1.20098	26

SODIUM BISULPHITE SOLUTIONS—SPECIFIC GRAVITY AND STRENGTH AT 15° C.

Specific Gravity.	Degrees Bé.	Per cent. NaHSO ₃ .	SO ₂ .
1.008	1	1.6	0.4
1.022	3	2.1	1.3
1.038	5	3.6	2.2
1.052	7	5.1	3.1
1.068	9	6.5	3.9
1.084	11	8.0	4.8
1.100	13	9.5	5.7
1.116	15	11.2	6.8
1.134	17	12.8	7.8
1.152	19	14.6	9.0
1.171	21	16.5	10.2
1.190	23	18.5	11.5
1.210	25	20.9	12.9
1.230	27	23.5	14.5
1.252	29	25.9	15.9
1.275	31	28.9	17.8
1.298	33	31.7	19.6
1.321	35	34.7	22.5
1.345	37	38.0	23.6

SODIUM ACETATE SOLUTIONS—SPECIFIC GRAVITY AT 17.5° C.

Specific Gravity.	Per cent. NaC ₂ H ₃ O ₂ .	Per cent. NaC ₂ H ₃ O ₂ + 3H ₂ O.
1.0150	3.015	5
1.0310	6.030	10

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Specific Gravity.	Per cent. $\text{NaC}_2\text{H}_3\text{O}_2$.	Per cent. $\text{NaC}_2\text{H}_3\text{O}_2 + 3\text{H}_2\text{O}$.
1.0470	9.045	15
1.0630	12.060	20
1.0795	15.075	25
1.0960	18.090	30
1.1130	21.105	35
1.1305	24.120	40
1.1485	27.135	45
1.1670	30.150	50

SULPHUROUS ACID—SPECIFIC GRAVITY AT 15° C.

Specific Gravity.	Per cent. SO_2 .	Specific Gravity.	Per cent. SO_2 .
1.0028	0.5	1.0302	5.5
1.0056	1.0	1.0328	6.0
1.0085	1.5	1.0353	6.5
1.0113	2.0	1.0377	7.0
1.0141	2.5	1.0401	7.5
1.0168	3.0	1.0426	8.0
1.0194	3.5	1.0450	8.5
1.0221	4.0	1.0474	9.0
1.0248	4.5	1.0497	9.5
1.0275	5.0	1.0520	10.0

STANNIC CHLORIDE SOLUTIONS—STRENGTH AND SPECIFIC GRAVITY AT 15° C.

Specific Gravity.	Per cent. $\text{SnCl}_2 + 2\text{H}_2\text{O}$.	Specific Gravity.	Per cent. $\text{SnCl}_4 + 5\text{H}_2\text{O}$.
1.012	2	1.059	10
1.024	4	1.072	12
1.036	6	1.084	14
1.048	8	1.097	16

Reference Tables

Specific Gravity.	Per cent. $\text{SnCl}_2 + 2\text{H}_2\text{O}$.	Specific Gravity.	Per cent. $\text{SnCl}_4 + 5\text{H}_2\text{O}$.
1.110	18	1.447	58
1.124	20	1.468	60
1.137	22	1.491	62
1.151	24	1.514	64
1.165	26	1.538	66
1.180	28	1.563	68
1.195	30	1.587	70
1.210	32	1.614	72
1.227	34	1.641	74
1.242	36	1.669	76
1.259	38	1.698	78
1.276	40	1.727	80
1.293	42	1.759	82
1.310	44	1.791	84
1.329	46	1.824	86
1.347	48	1.859	88
1.366	50	1.893	90
1.386	52	1.932	92
1.406	54	1.969	94
1.426	56	1.988	96

TANNIN SOLUTIONS—SPECIFIC GRAVITY AT 15° C.

Specific Gravity.	Per cent.	Specific Gravity.	Per cent.
1.0040	1.0	1.0072	1.8
1.0044	1.1	1.0076	1.9
1.0048	1.2	1.0080	2.0
1.0052	1.3	1.0084	2.1
1.0056	1.4	1.0088	2.2
1.0060	1.5	1.0092	2.3
1.0064	1.6	1.0096	2.4
1.0068	1.7	1.0100	2.5

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Specific Gravity.	Per cent.	Specific Gravity.	Per cent.
1.0104	2.6	1.0172	4.3
1.0108	2.7	1.0176	4.4
1.0112	2.8	1.0180	4.5
1.0116	2.9	1.0184	4.6
1.0120	3.0	1.0188	4.7
1.0124	3.1	1.0192	4.8
1.0128	3.2	1.0196	4.9
1.0132	3.3	1.0200	5.0
1.0136	3.4	1.0242	6.0
1.0140	3.5	1.0324	8.0
1.0144	3.6	1.0406	10.0
1.0148	3.7	1.0489	12.0
1.0152	3.8	1.0572	14.0
1.0156	3.9	1.0656	16.0
1.0160	4.0	1.0740	18.0
1.0164	4.1	1.0824	20.0
1.0168	4.2		

TARTARIC ACID SOLUTIONS—SPECIFIC GRAVITY AT 15° C.

Specific Gravity.	Per cent.	Specific Gravity.	Per cent.
1.0045	1	1.0969	20
1.0090	2	1.1072	22
1.0179	4	1.1175	24
1.0273	6	1.1282	26
1.0371	8	1.1393	28
1.0469	10	1.1505	30
1.0565	12	1.1615	32
1.0661	14	1.1726	34
1.0761	16	1.1840	36
1.0865	18	1.1959	38

Reference Tables

Specific Gravity.	Per cent.	Specific Gravity.	Per cent.
1.2078	40	1.2696	50
1.2198	42	1.2828	52
1.2317	44	1.2961	54
1.2441	46	1.3093	56
1.2568	48	1.3220	57.9

Saturated.

TIN CRYSTALS (STANNOUS CHLORIDE) SOLUTION—STRENGTH AND SPECIFIC GRAVITY AT 15° C.

Specific Gravity.	Per cent. $\text{SnCl}_2 + 2\text{H}_2\text{O}$.	Specific Gravity.	Per cent. $\text{SnCl}_2 + 2\text{H}_2\text{O}$.
1.013	2	1.330	40
1.026	4	1.352	42
1.040	6	1.374	44
1.054	8	1.397	46
1.068	10	1.421	48
1.083	12	1.445	50
1.097	14	1.471	52
1.113	16	1.497	54
1.128	18	1.525	56
1.144	20	1.554	58
1.161	22	1.582	60
1.177	24	1.613	62
1.194	26	1.644	64
1.212	28	1.677	66
1.230	30	1.711	68
1.249	32	1.745	70
1.268	34	1.783	72
1.288	36	1.821	74
1.309	38	1.840	75

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TARTAR EMETIC SOLUTIONS—STRENGTH AND SPECIFIC GRAVITY AT 17.5° C.

Specific Gravity.	Per cent. SbOKC ₄ H ₄ O ₆ + ½ H ₂ O.	Specific Gravity.	Per cent. SbOKC ₄ H ₄ O ₆ + ½ H ₂ O.
1.005	0.5	1.022	3.5
1.007	1.0	1.027	4.0
1.009	1.5	1.031	4.5
1.012	2.0	1.035	5.0
1.015	2.5	1.038	5.5
1.018	3.0	1.044	6.0

WATER ANALYSIS.

Analyses of water are sometimes reported as parts per million, and sometimes grains per imperial gallon, and sometimes grains per United States gallon. The following table gives all three values:

Parts per Million.	Grains per Imperial Gallon.	Grains per United States Gallon.	Parts per Million.	Grains per Imperial Gallon.	Grains per United States Gallon.
1	0.0700	0.0583	14	0.9800	0.8165
2	0.1400	0.1166	15	1.0500	0.8747
3	0.2100	0.1749	16	1.1200	0.9330
4	0.2800	0.2332	17	1.1900	0.9914
5	0.3500	0.2915	18	1.2600	1.0497
6	0.4200	0.3499	19	1.3300	1.1080
7	0.4900	0.4082	20	1.4000	1.1663
8	0.5600	0.4665	21	1.4700	1.2246
9	0.6300	0.5248	22	1.5400	1.2829
10	0.7000	0.5831	23	1.6100	1.3413
11	0.7700	0.6414	24	1.6800	1.3996
12	0.8400	0.6998	25	1.7500	1.4579
13	0.9100	0.7581	26	1.8200	1.5162

Reference Tables

Parts per Million.	Grains per Imperial Gallon.	Grains per United States Gallon.	Parts per Million.	Grains per Imperial Gallon.	Grains per United States Gallon.
27	1.8900	1.5745	58	4.0600	3.3824
28	1.9600	1.6329	59	4.1300	3.4407
29	2.0300	1.6912	60	4.2000	3.4990
30	2.1000	1.7495	61	4.2700	3.5573
31	2.1700	1.8078	62	4.3400	3.6157
32	2.2400	1.8661	63	4.4100	3.6740
33	2.3100	1.9244	64	4.4800	3.7323
34	2.3800	1.9828	65	4.5500	3.7909
35	2.4500	2.0411	66	4.6200	3.8489
36	2.5200	2.0994	67	4.6900	3.9073
37	2.5900	2.1577	68	4.7600	3.9656
38	2.6600	2.2160	69	4.8300	4.0239
39	2.7300	2.2745	70	4.9000	4.0822
40	2.800	2.3327	71	4.9700	4.1405
41	2.8700	2.3910	72	5.0400	4.1988
42	2.9400	2.4493	73	5.1100	4.2575
43	3.0100	2.5076	74	5.1800	4.3155
44	3.0800	2.5659	75	5.2500	4.3738
45	3.1500	2.6243	76	5.3200	4.4321
46	3.2200	2.6826	77	5.3900	4.4904
47	3.2900	2.7409	78	5.4600	4.5488
48	3.3600	2.7992	79	5.5300	4.6071
49	3.4300	2.8575	80	5.6000	4.6654
50	3.5000	2.9129	81	5.6700	4.7237
51	3.5700	2.9742	82	5.7400	4.7820
52	3.6400	3.0325	83	5.8100	4.8403
53	3.7100	3.0908	84	5.8800	4.8987
54	3.7800	3.1491	85	5.9500	4.9570
55	3.8500	3.2074	86	6.0200	5.0154
56	3.9200	3.2658	87	6.0900	5.0736
57	3.9900	3.3241	88	6.1600	5.1319

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Parts per Million.	Grains per Imperial Gallon.	Grains per United States Gallon.	Parts per Million.	Grains per Imperial Gallon.	Grains per United States Gallon.
89	6.2300	5.1903	95	6.6500	5.5402
90	6.3000	5.2486	96	6.7200	5.5985
91	6.3700	5.3069	97	6.7900	5.6568
92	6.4400	5.3652	98	6.8600	5.7151
93	6.5100	5.4235	99	6.9300	5.7734
94	6.5800	5.4818	100	7.0000	5.8318

SYMBOLS AND ATOMIC WEIGHTS OF THE ELEMENTS.

Name.	Symbol.	Atomic Weight.			
		H = 1.	O = 16.	Richards.	German.
Aluminum	Al....	26.9	27.1	27.1	27.1
Antimony	Sb....	119.3	120.2	120.0	120.
Argon	A....	39.6	39.9	39.9?	40.
Arsenic	As....	74.45	75.0	75.0	75.
Barium	Ba....	136.4	137.40	137.43	137.4
Bismuth	Bi....	206.9	208.5	208.0	208.5
Boron	B....	10.9	11.0	10.95	11.
Bromine	Br....	79.36	79.96	79.955	79.96
Cadmium	Cd....	111.55	112.4	112.3	112.
Caesium	Cs....	132.	133.	132.9	133.
Calcium	Ca....	39.8	40.1	40.1	40.
Carbon	C....	11.91	12.0	12.001	12.00
Cerium	Ce....	139.	140.	140.	140.
Chlorine	Cl....	35.18	35.45	35.455	35.45
Chromium	Cr....	51.7	52.1	52.14	52.1
Cobalt	Co....	58.55	59.00	59.00	59.
Columbium	Cb....	93.3	94.	94.	94.
(Niobium)					
Copper	Cu....	63.1	63.6	63.60	63.6
Erbium	Er....	164.8	166.0	166.	166.

Reference Tables

Name.	Symbol.	Atomic Weight.			
		H = 1.	O = 16.	Richards.	German.
Fluorine	F....	18.9	19.05	19.05	19.
Gadolinium	Gd....	155.	156.	156.	...
Gallium	Ga....	69.5	70.0	70.0	70.
Germanium	Ge....	71.9	72.5	72.5	72.
Glucinum	Gl....	9.0	9.1	9.1	9.1
(Beryllium)					
Gold	Au....	195.7	197.2	197.3	197.2
Helium	He....	4.	4.	4.0?	4.
Hydrogen	H....	1.000	1.008	1.0075	1.01
Indium	In....	113.1	114.0	114.	114.
Iodine	I....	125.90	126.85	126.85	126.85
Iridium	Ir....	191.5	193.0	193.0	193.
Iron	Fe....	55.46	55.88	56.0	56.
Krypton	Kr....	81.2	81.8	.....	81.8
Lanthanum	La....	137.9	138.9	138.5	138.
Lead	Pb....	205.35	206.92	206.92	206.9
Lithium	Li....	6.98	7.03	7.03	7.03
Magnesium	Mg....	24.1	24.3	24.36	24.36
Manganese	Mn....	54.6	55.0	55.02	55.
Mercury	Hg....	198.50	200.0	200.0	200.3
Molybdenum	Mo....	95.3	96.0	96.0	96.
Neodymium	Ne....	142.5	143.6	143.6	144.
Neon .....	.....	19.9	20.	.....	20.
Nickel	Ni....	58.3	58.70	58.70	58.7
Nitrogen	N....	13.93	14.04	14.045	14.04
Osmium	Os....	189.6	191.0	190.8	191.
Oxygen	O....	15.88	16.000	16.0000	16.00
Palladium	Pd....	105.7	106.5	106.5	106.
Phosphorus	P....	30.77	31.0	31.0	31.
Platinum	Pt....	193.3	194.8	195.2	194.8
Potassium	K....	38.86	39.15	39.140	39.15
Praseodymium	Pr....	139.4	140.5	140.5	140.
Radium	Ra....	223.3	225.

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Name.	Symbol.	Atomic Weight.			
		H = 1.	O = 16.	Richards.	German.
Rhodium	Rh....	102.2	103.0	103.0	103.
Rubidium	Rb....	84.8	85.4	85.44	85.4
Ruthenium	Ru....	100.9	101.7	101.7	101.7
Samarium	Sa....	148.9	150.0	150.0	150.
Scandium	Sc....	43.8	44.1	44.	44.1
Selenium	Se....	78.6	79.2	79.2	79.1
Silicon	Si....	28.2	28.4	28.4	28.4
Silver	Ag....	107.12	107.93	107.930	107.93
Sodium	Na....	22.88	23.05	23.050	23.05
Strontium	Sr....	86.94	87.60	87.68	87.6
Sulphur	S....	31.83	32.06	32.065	32.06
Tantalum	Ta....	181.6	183.0	183.	183.
Tellurium	Te....	126.6	127.6	127.5	127.
Terbium	Tb....	158.8	160.	160.	....
Thallium	Tl....	202.61	204.15	204.15	204.1
Thorium	Th....	230.8	232.5	233.	232.
Thulium	Tm....	169.7	171.0	170.	....
Tin	Sn....	118.1	119.0	119.0	118.5
Titanium	Ti....	47.7	48.10	48.17	48.1
Tungsten	W....	182.6	184.	184.4	184.
Uranium	U....	236.7	238.5	240.	239.5
Vanadium	V....	50.8	51.2	51.4	51.2
Xenon	X....	127.	128.	....	128.
Ytterbium	Yb....	171.7	173.0	173.	173.
Yttrium	Yt....	88.3	89.0	89.0	89.
Zinc	Zn....	64.9	65.4	65.40	65.4
Zirconium	Zr....	89.9	90.6	90.5	90.6



PART II

Theory of Dyeing



Theory of Dyeing

For many years the theory of the operation of dyeing has been of general interest, that is, the cause of the attraction of the dye-stuff to the fibre and the chemical or physical changes taking place. Prof. E. Knecht during the past year published in the *Journal of the Society of Dyers and Colorists* a most complete review of the work which had been done, with an account of his personal researches in the subject; and this is here given as the sum of what is known at the present time from the point of view of the chemical combination of coloring matter and fibres.

ON THE THEORY OF DYEING.¹

BY PROFESSOR EDMUND KNECHT, PH.D., F.I.C.

In three papers which the author read before this Society in 1888 and 1889, he communicated the results of an investigation carried out with the assistance of some of his students, with the object of obtaining a clearer explanation of the dyeing process than that which existed at the time. Their experiments, which were conducted chiefly on wool and silk, yielded, in the main, the following results:

(1) When wool or silk are dyed with basic colors, until the dyebath is exhausted, the whole of the hydrochloric acid originally present in the dyestuff (in chemical combination) is left in the bath.

(2) By the partial hydrolytic decomposition of both wool and

¹ *Journal Soc. Dyers and Colorists*, 1904, p. 238.

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silk, soluble products (lanuginic and sericinic acids respectively) are obtained, which he found to possess the remarkable property of precipitating both acid and basic colors from their aqueous solutions, with the production of intensely colored lakes.

(3) Wool, boiled with dilute sulphuric acid and subsequently repeatedly extracted with boiling distilled water until it no longer yielded any trace of free acid, was found to dye in neutral solution in acid colors (*e.g.*, Crystal scarlet) in deeper and fuller shades than when dyed in the ordinary way,—*i.e.*, with the addition of sulphuric acid to the dyebath.

(4) In dyeing wool with a large excess of certain colors (*e.g.*, Picric acid and Naphthol Yellow S), it was found that the dyestuffs were not taken up indiscriminately by the fibre, but in the proportion of their molecular weights.

Based on these results, on the fact that all textile fibres as well as dyestuffs evince more or less pronounced acid or basic properties, and on the important observation of Jacquemin that wool is dyed red in the colorless aqueous solution of rosaniline, he came to the conclusion that the dyeing process could not be explained by the assumption that the coloring matter is merely taken up mechanically by the fibre, and that a chemical process or processes play the chief part in this interesting phenomenon.

In two articles which appeared in the *Journal*,² he endeavored to show a connection between the hydrolytic dissociation of coloring matters of their dyeing power. Thus, if a dilute aqueous solution of Magenta (in which, as is well known, wool can be readily dyed) is spotted on to filter paper, a large colorless halo is formed after a short time round the colored spot, and this colorless portion was found to contain a considerable proportion of the hydrochloric acid originally present in the Magenta. By the addition of successive amounts of hydrochloric acid to the Magenta solution, a point is arrived at, at which the formation of a halo is arrested, but the solution will then no longer dye wool.

² *Journal Soc. Dyers and Colorists*, 1903, p. 158; 1904, p. 59.

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Similarly, an alcoholic solution of Crystal Violet shows no halo, but also has no dyeing power. Similar regularities were observed with regard to the acid colors, which, as a rule, showed no halo in neutral solution, but showed this phenomenon on being acidulated.

In a further communication to the Society of Dyers and Colorists,³ it was shown that when wool or silk is dyed with Night Blue and then extracted with alcohol, the solution thus obtained contains the Night Blue base in combination with a constituent of the fibre. These lake-giving substances were isolated in the case of both fibrous materials, and showed properties similar to lanuginic and sericinic acids respectively. The Night Blue lakes of both these proteids are soluble in alcohol.

Since the publication of his first papers on the subject, many other workers have entered the field and our knowledge of the subject has thus been considerably enriched.

The first treatise which appeared was that of O. N. Witt.⁴ This author regards the fibres as solid solvents, which in the process of dyeing extract the coloring matter from the aqueous solution of the dyebath, just as a solvent like ether will extract resorcin from its aqueous solution. The extent to which the dyebath is exhausted will depend upon the relative solubility of the dyestuff in the substance of the fibre on the one hand and in the dyebath on the other. The main support of his theory is the result of the following experiment: If a skein of white silk is heated in a solution of Magenta, color is abstracted from the solution and the silk is dyed red. If this red silk is now put into alcohol and heated, the color passes from the silk into the alcohol, in which Witt claims it is more soluble than in the substance of the fibre. But if the solution be diluted with water, the color, being less soluble in the diluted alcohol than in the substance of the silk fibre, returns to the latter.

³ Journal Soc. Dyers and Colorists, 1902, p. 101.

⁴ Faerber Ztg., 1890-91, p. 1.

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Sisley⁵ seeks to confirm Witt's theory by substituting a neutral solvent such as amyl alcohol for silk, and claims that this solvent, like silk, abstracts a red color from the colorless solution of rosaniline. Prud'homme,⁶ however, refuted this statement, and the author showed⁷ that if the amyl alcohol is free from organic acids, and the carbonic acid of the air be excluded, no coloration of the amyl alcohol takes place.

Witt's theory, a full account of which appeared at the time in the *Journal of the Society of Dyers and Colorists*,⁸ is undoubtedly the simplest explanation of the dyeing process which has been brought forward, and has found many adherents; but it is based entirely on qualitative observations, and as far as wool and silk are concerned is not in conformity with the facts ascertained by others.

According to the views expressed by L. Vignon,⁹ dyeing depends largely upon dissociation. He points out that in every dyeing process a system of three substances takes part, viz., the absorbent fibre, the dyestuff, and the solvent, and that these attain an equilibrium which is determined by the chemical forces and the conditions of dissociation of the system. Accordingly the law of multiple proportions does not apply in dyeing processes. Nevertheless, Vignon is of opinion that most dyeing processes are chemical in character and may be explained on this assumption, especially if the chemical action is accompanied by dissociation.

G. v. Georgievics¹⁰ is entirely opposed to the idea of any chemical change taking place in the fixation of the dyestuff by the fibre. In reference to Prof. E. Knecht's work on the decomposition of the basic dyes by the wool fibre, he maintains that not only wool, but also such indifferent substances as unglazed

⁵ *Rev. Gen. des Mat. Col.*, 1900, p. 113.

⁶ *Ibid.*, 1900, p. 156.

⁷ *Jour. Soc. Dyers and Col.*, 1900, p. 123.

⁸ *Ibid.*, 1890, p. 173.

⁹ *Bull. Soc. Ind. de Mulh.*, 1893, p. 407.

¹⁰ *Mit. d. Tech. G. Mns.*, 1895, p. 149.

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porcelain and glass beads, will decompose Magenta, hydrochloric acid being left in solution and a colored red substance remaining on the object. He omits to state, however, whether the hydrochloric acid is free or combined. The dyeing of wool with Magenta is explained by G. v. Georgievics by the assumption that in the first instance a dissociation of the Magenta takes place into hydrochloric acid and a colored ammonium base of rosaniline, which latter is mechanically taken up by the fibre by a process of "adsorption." H. Weil,¹¹ however, disputed the existence of a colored ammonium base, and asserts that the supposed colored base of v. Georgievics owes its color to the presence of unchanged Magenta in the precipitate. Later, Hantsch¹² came to the conclusion that three different rosaniline bases are capable of existing, two of which are red and one (the carbinol base) colorless. Both the colored modifications, however, pass over into the colorless modifications by mere standing in aqueous solution. v. Baeyer¹³ regards the existence of a colored ammonium base in the sense referred to by Georgievics as highly improbable.

In regard to acid dyes, v. Georgievics concludes that because the animal fibres take up a larger proportion of these colors in presence of an excess of sulphuric acid, the chemical theory of dyeing is utterly fallacious. He argues that since sulphuric acid is a stronger acid than indigotine disulphuric acid (no experimental evidence is adduced to support this assertion), an excess of the former should not be favorable in silk-dyeing to the formation of a salt-like combination between the fibroine and the coloring matter. He further shows that when wool dyed with picric acid is extracted with alcohol, it readily yields the picric acid to this solvent in an unchanged condition, from which he infers that the dyestuff can only have been mechanically held by the fibre, and could not have been in chemical combination with

¹¹ Jour. Soc. D. and C., 1897, p. 38.

¹² Berl. Ber., 1900, p. 752.

¹³ Ibid., 1904, p. 2849.

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it. Binz and Schroeter¹⁴ do not, however, accept this as a proof that no chemical combination exists between the fibre and the dye-stuff, quoting cases in which alcohol is capable of bringing about decompositions of a similar character. They further point out, that if the picric acid is held mechanically by the fibre, it should be extracted by benzine, in which it is readily soluble, whereas experience shows that not a trace is removed by this solvent from the dyed wool.

The same author¹⁵ further conducted experiments with the object of ascertaining whether in dyeing silk with indigo extract Henry's law of distribution (as stated by van t'Hoff and by Nernst) was fulfilled,—i.e., whether the amounts of color taken up by the fibre (C_s) and left in solution (C_w) gave constant values for the expression $\frac{C_s}{C_w}$. This was not found to be the case. He found, however, that in dilute solution most processes of dyeing took place according to the equation $\frac{x_1 \sqrt{C_s}}{C_w} = \text{constant}$, in which x denotes the affinity of the coloring matter for the fibre. In support of his theory, the author has from time to time published figures obtained in dyeing both wool and cotton with various coloring matters, which would appear to bear out its validity.

In a series of experiments conducted by Walker and Appleyard,¹⁶ these authors came to the conclusion that in the dyeing of silk with Picric acid (without additions to the dyebath) a real equilibrium is attained, which is independent of the original distribution of the materials. On the other hand, diphenylamine, when dyed in a solution of Picric acid, remains unchanged up to a certain temperature, but the moment this temperature is reached, combination takes place with the formation of a definite

¹⁴ Berl. Ber., 1904, p. 727.

¹⁵ Ber. d. K. Ak. d. Wissen. Wien, Nov., 1894.

¹⁶ Jour. Chem. Soc., 1896, p. 650.

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colored picrate. Their work seems to have been left uncompleted as far as the theory of dyeing is concerned.

L. Hwass¹⁷ and G. Spohn¹⁸ endeavor to explain the dyeing process by the action of the molecular forces of a physical or mechanical character. The latter, by means of microscopic examinations, that cotton chrome yellow contains mechanically deposited crystals of lead chromate. He maintains that the process of dyeing is due to purely mechanical forces. These forces are probably molecular forces, the action of which, as far as the dyeing process is concerned, has not been sufficiently investigated.

C. O. Weber¹⁹ defines the dyeing of cotton with the benzidine dyes as being by an aqueous solution of a dye of very small coefficient of diffusion, formed inside the cellular cavities of the cotton fibre by means of a dyebath possessing a high osmotic pressure. The fastness of these dyes as regards "bleeding" is proportionate to their inertia of diffusion and inversely proportionate to the magnitude of their diffusion coefficient. In support of this theory this author points out that dinitro-cellulose dyes with the benzidine dyes exactly like ordinary cotton. But the same dinitro-cellulose dissolved in acetone and produced as a film does not dye. The explanation is that the former contains cellular cavities capable of retaining water, while in the latter the presence of cavities is excluded.

In the same year W. P. Dreaper²⁰ carried out a series of experiments with Primuline on silk, and from the results obtained came to the following conclusions: Dyeing depends primarily on a diffusion process obeying a modified form of the general laws of osmosis, supplemented in some cases, if not all, by a chemical or series of chemical reactions between the fibre and the dye.

¹⁷ Faerber, Zelt., 1890-1, p. 221, 243.

¹⁸ Dingler's Poly. Jour., 1893, p. 210.

¹⁹ Jour. Soc. Chem. Ind., 1894, p. 120.

²⁰ Ibid., 1904, p. 95.

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Gnehm and Roetheli²¹ first proved experimentally that when cotton is dyed with direct colors, it takes up the dyestuff in an unchanged condition,—i.e., in the form of their salts. From their investigations these authors came to the following conclusions: The dyeing of different fibres does not depend upon the same processes (or only partially), as is the case with animal fibres. Even with these latter, different phenomena take place, mechanical effects accompanying chemical reactions. In a later publication on this subject, Gnehm²² somewhat modifies his views with regard to the dyeing of cotton with the direct colors, pointing out that the free color acids may also act as dyestuffs.

According to F. Krafft,²³ dyeing consists in the great majority of cases of the separation of colloid (adhesive and resistant) salts on or in the fibre. In support of his theory he points out that the molecular weights (determined by the boiling point method) of Rosaniline hydrochloride, Methyl Violet, and Methylene Blue are apparently much higher in aqueous solution than in alcoholic solution. According to him, tannic acid is a colloid, likewise tannate of antimony. The compounds of phenol-like dyestuffs, such as Alizarine, with mordants like aluminium and ferric hydrates, are also colloid in character. Like Weber and Gnehm, he asserts that the direct colors are taken up by cotton in an unchanged condition, the dyed material giving the same reactions as the free dyestuff. This is explained by assuming that in aqueous solution, by reason of their relatively high molecular weights, these dyestuffs are more or less sparingly soluble colloid substances. Benzopurpurine shows in aqueous solution an approximate molecular weight of 3000 by the boiling point method. Additional evidence of its colloid character is furnished by the fact that when its aqueous solution is placed in a parchment bag and this in distilled water, no diffusion of the dyestuff

²¹ *Zelt. für Ang. Chem.*, 1898, pp. 482, 501.

²² *Ibid.*, 1902, No. 15.

²³ *Berlin Ber.*, 1899, p. 1602.

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takes place, even after several weeks' immersion, whereas dye-stuffs like Magenta and Methylene Blue begin to diffuse under similar conditions after one or two hours. In the dyeing of wool and silk, a separation in the fibre of colloid or membranous salts also takes place, in the formation of which, however, the fibre itself takes part. This is due in the case of wool to the presence of lanuginic acid, a substance which is capable of combining with both acids and bases.

A. Reychler²⁴ records the results of some interesting experiments which he carried out with basic dyes on wool. He determined the electrical conductivity of the exhausted dyebaths in which wool (which had been previously boiled several times in water alone) has been dyed with Magenta, Chrysoidine, and Vesuvine (Bismarck Brown) respectively. The following is a summary of his conclusions: In dyeing, wool is brought into contact with a very dilute and perfectly dissociated solution of a coloring matter possessing a salt-like character. The reactions which take place indicate that the two constituents of the salt act independently of each other. The color base reacts with the wool, being fixed by some acid group of the keratine, probably with elimination of water. The hydrochloric acid, on the other hand, behaves exactly like a free acid of the same concentration would behave. It saturates the bases which the action of water alone liberates from the fibre, and extracts from the wool besides an amount of basic substances sufficient to completely neutralize the solution. The conductivity of solutions in which wool has been dyed with Magenta, and in which wool has been boiled in hydrochloric acid equivalent to that present in the Magenta, is the same in each case.

H. Erdmann,²⁵ in dealing with the dyeing of cotton with direct colors, attempts to explain the process on the assumption that

²⁴ Bull. Soc. Chlm. de Paris, 1897, p. 449.

²⁵ Chem. Ind., 1896, 1.

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cotton cellulose possesses a quinonoid structure by virtue of which it shows some affinity for the benzidine derivatives.

Binz and Schroeter,²⁰ while admitting the probability of salt formation taking place in the dyeing of wool with certain colors, ascribe the fixation of the dyestuff in most cases where fast shades are obtained to condensation in the nucleus between the quinonoid dyestuff molecule and the substance of the fibre. This view is opposed by v. Georgievics²¹ and by Prager,²² the latter showing that not only ortho and para, but also metaoxyazobenzene behaves towards the wool fibre as a dyestuff.

Further contributions on the subject are to be found in the *Revue Générale des Matières Colorantes* by Sisley and Prud'homme, which are chiefly controversial in character, the former defending the mechanical, the latter the chemical theory, while a series of articles has also appeared in that journal by Gillet.

Biltz²³ has experimented with colloid solutions of certain metals and inorganic salts as dyestuffs, and appears to regard the possession on the colloid character as an essential property of a dyestuff. He regards the dyeing process as the solution of a colloid in a colloid.

Behren²⁴ has examined a number of dyed fibres under the microscope with and without polarized light, but the conclusions which he draws from these observations are not very clear. He further concludes, from the behavior of certain nitric acid and benzoic acid esters of cellulose in dyeing, that the dyeing of cotton with direct colors is a chemical process.

Heidenheim²⁵ has published lengthy articles on the behavior

²⁰ Berl. Ber., 1902, 4225; 1904.

²¹ Zeit. f. Farb. and Tex. Chemie, 1903, p. 215; Berl. Ber., 1903, p. 3787.

²² Ibid., 1904, p. 177.

²³ Berl. Ber., 1904, p. 1766.

²⁴ Chem. Zetig., 1903, No. 102.

²⁵ Arch. f. die ges. Physiol., 1902, 90, p. 115; 1903, 96, p. 440.

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of dyestuffs towards various albuminoids, and comes to the conclusion that in most cases chemical action takes place. His work does not refer to dyeing in the ordinary sense, but rather to staining for microscopic work in animal physiology.

Mention may also be made here of a very interesting observation recorded by Nietski³² in connection with the ethyl ether of tetra-bromphenol-phthalein. The substance itself is yellow, but its salts are blue. Wool dyed in the slightly acidulated solution of the yellow substance is dyed blue. Similarly, Caro (private communication) has shown that when wool is boiled with tetrachlorquinon, a substance possessing only a light yellow color, the fibre is dyed a rich and absolutely fast brown. The production of this color might either be due to the formation in the fibre of a condensation product between the tetrachlorquinon and the substance of the fibre, or to that of a chloranilate, in which the fibre plays the part of a base.

Quite recently Suida³³ has conducted experiments on the behavior of dyes towards natural finely divided silicates which were acid in character. These he finds to be permanently dyed with basic dyes, but not at all with acid dyes. With China Clay, the different color bases are found to combine in equivalent proportions, probably to form salts. This author concludes that the process of dyeing with basic colors is far more chemical than physical in its nature.

The author has endeavored, in this very brief summary, to give some idea of the large amount of work which has been done since 1888, the aim of each investigator having been to explain such a common and well-known phenomenon as the process of dyeing, and if possible to bring it into line with other well-known phenomena which are governed by definite laws. Some of these

³² Chem. der Org. Farbstoffe, 1900.

³³ Ber. d. K. Ak. d. Wissensch., 1904, July.

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investigators have taken all classes of fibres *en bloc*, but the majority have adopted the wiser plan of dealing only with one kind of fibre at a time. Of these latter, the majority come to the conclusion that in the dyeing of the animal fibres chemical action plays at least an important part, while the dyeing of cotton with direct colors is supposed by nearly all to be physical or mechanical in character.

Many years before the publication of his first communications on the theory of dyeing, it was argued by the adherents of the mechanical theory that there was no evidence of chemical action taking place during the dyeing process, such as alteration in temperature, a more or less complete change in the properties of the reacting substances, and, above all, the absence of any regularity in their relative quantities. Writing on this subject as far back as 1860, Charles O'Neill³⁴ points out that Walter Grum's objection, that if there were chemical combination there should be disorganization of the fibrous structure, is ruled out of order by choosing gun-cotton as an example. This substance, though deeply and permanently altered in its chemical properties, would pass in the hands of most persons as ordinary cotton. O'Neill further remarks that in dyeing only a very small portion of the fibre can be in actual chemical combination.

In 1889³⁵ the author endeavored to show, however, that in the dyeing of wool the laws which govern chemical combination are in some cases obeyed. The experiments were done at the time with three acid dyes—Picric Acid, Naphthol Yellow S, and Tartrazine—and one basic dye—Crystal Violet. With regard to the behavior of the basic dyes, he hopes to be able to make a further communication at a later date, but with regard to the acid dyes—Picric Acid and Naphthol Yellow (excepting Tartrazine, because subsequent investigations have shown that its then accepted for-

³⁴ Chemistry of Calico Printing, Dyeing and Bleaching.

³⁵ Jour. Soc. Dyers and Col., 1889, p. 74.

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mula was incorrect)—he then showed by means of quantitative determinations that when wool is dyed with a large excess of either of these dyestuffs, they are taken up in the proportion of their molecular weights.

Further work in this direction was not possible at the time, because no processes were available by means of which other dyestuffs could be estimated with a sufficient degree of accuracy (the colorimeter not being exact enough for such estimations). But since he has succeeded in working out an absolute method³⁶ by means of which the azo dyes can be estimated with great accuracy, he saw the possibility of attacking the question more profoundly. As the result of his investigations, he is able to show that in homologous series the amounts of the acid dyes taken up by wool are in proportion to their molecular weights.

In the new experiments only such coloring matters were compared with each other as belong to homologous or analogous series. It was necessary to prepare these first in the chemically pure condition in order, in the first instance, to obtain strictly comparable figures, and second, to obviate the disturbing influence of Glauber salt, or common salt, usually contained as accidental impurities or as diluents in the commercial articles. For it is well known from the researches of Hallitt,³⁷ that the presence of these salts in the dyebath exercise a restraining influence on the amount of color taken up by the fibre. All the dyestuffs used (with the exception of cresso and xylo-picric acids) yielded after drying at 140–150° C., on titrating with TiCl_3 , figures which showed them to be chemically pure. He was disappointed to find that cresso-picric and xylo-picric acids differed materially from ordinary Picric acid in their behavior towards titanous chloride, and could not be estimated by that means. But having convinced himself of the purity of his products by other

³⁶ Jour. Soc. Dyers and Col., 1903, p. 169.

³⁷ Ibid., 1899, p. 31.

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means, the author found that they could be accurately estimated by the old Night Blue process of Rawson.²⁸

The dyeing of the wool was conducted as in the previous experiments with a large excess (50, 25 per cent., etc.) of coloring matter at the boil, and with the addition of 30 per cent. sulphuric acid, for one hour. This apparently excessive quantity of acid was employed on account of the extraordinarily high percentages of dyestuff used. The dyeing was done in open vessels, the amount of water in the dyebath being about 100 times the weight of the wool. As evaporation took place the water in the dyebaths was replenished. It might appear at first sight that this mode of procedure would not be sufficiently exact to obtain accurate results, and he should not have ventured to use it had he not satisfied himself that the amount of water used had, within fairly wide limits (50-200 times the weight of the wool), no material influence on the amount of dyestuff taken up by the fibre. From other blank experiments it was ascertained that wool boiled for an hour in water with the addition of 30 per cent. sulphuric acid yielded nothing to the bath which might interfere with the accuracy of the results.

As in the previous experiments, the amounts of color taken up by the fibre were estimated indirectly by titrating the dyestuffs remaining in the bath (or in some cases an aliquot volume of the bath) with titanous chloride. The difference between the figures obtained in this manner and the amounts of dyestuff originally employed gave the amounts taken up by the fibre.

A re-examination of the former results with Picric Acid and Naphthol Yellow S by means of the more exact method with titanous chloride yielded figures which differ slightly from those obtained at that time.

	Found.	Calc.
Picric Acid	12.58
Naphthol Yellow S.....	20.80	21.38%

²⁸ Jour. Soc. Dyers and Col., 1888, p. 82.

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The Naphthol Yellow S employed for this purpose was the chemically pure di-potassium salt,³⁹ which was found to give accurate results by the titanous chloride method.

The new experiments were conducted with five series of coloring matters, viz.:

First Series.—Orange G (Sodium salt of the dyestuff from diazotized aniline and G Salt), molecular weight, 452; and Crystal Scarlet (sodium salt of the dyestuff from diazotized alpha-naphthylamine and G salt), molecular weight, 502.

Dyestuff.	Amount used.	Amount taken up by fibre.	Calculated.
	Per cent.	Per cent.	Per cent.
Orange G.....	50	16.24	.....
Crystal Scarlet	50	18.23	18.02
Orange G.....	25	15.68	.....
Crystal Scarlet	25	17.42	17.40

The calculated amounts of Crystal Scarlet are obtained from the amounts of Orange G obtained under similar conditions by multiplying by the fraction $\frac{502}{452}$. In the subsequent series the calculated amounts are obtained by a similar mode of procedure.

Second Series.—Scarlet 2G (sodium salt of the dyestuff from diazotized aniline and R salt), molecular weight, 452; and Xyline Scarlet (sodium salt of the dyestuff from diazotized metaxylydine and R salt), molecular weight, 479.

Dyestuff.	Amount used.	Amount taken up by fibre.	Calculated.
	Per cent.	Per cent.	Per cent.
Scarlet 2G	50	16.37	.....
Xylydine Scarlet.....	50	17.12	17.30
Scarlet 2G	25	15.53
Xylydine Scarlet.....	25	16.22	16.40

³⁹ Berl. Ber., 1904, p. 3475.

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Third Series.—Orange II (sodium salt of the dyestuff from diazotized sulphanilic acid and beta-naphthol), molecular weight, 350; and Fast Red A (sodium salt of the dyestuff from diazotized naphthionic acid and beta-naphthol), molecular weight, 400.

Dyestuff.	Amount used.	Amount taken up by fibre.	Calculated.
	Per cent.	Per cent.	Per cent.
Orange II.....	50	20.40	.....
Fast Red A.....	50	23.38	20.30
Orange II.....	25	16.46	.....
Fast Red A.....	25	18.75	18.80

Fourth Series.—Fast Acid Magenta B (sodium salt of the dyestuff from diazotized aniline, combined in alkaline solution, molecular weight, 539.

Dyestuff.	Amount used.	Amount taken up by fibre.	Calculated.
	Per cent.	Per cent.	Per cent.
Fast Acid Magenta B.....	50	16.71	.....
Corresp. Naphthylamine Compound ..	50	18.66	18.41

Fifth Series.—Picric Acid, molecular weight, 229; Cresso-picric acid (sym. trinitrocressol), molecular weight, 243; and xylo-picric acid (sym. trinitro-xylenol), molecular weight, 257.

Dyestuff.	Amount used.	Amount taken up by fibre.	Calculated for Picric Acid = 12.58 per cent.	Calculated for Trinitrocressol = 14.60 per cent.
	Per cent.	Per cent.		
Picric Acid	50	12.58
Trinitrocressol	50	14.60	13.40
Trinitroxylenol	50	15.28	14.10	15.40

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From the results obtained in this last series it will be seen that Pieric Acid shows in comparison with its homologues a somewhat abnormal behavior. But if the amounts of Cresso-pieric acid and Xylo-pieric acid taken up by wool under similar conditions be compared, it will be seen that they behave like the azo dyes in the four preceding series.

In dyeing wool with increasing amounts of the dyestuffs mentioned in the various series, it is interesting to note that in each case a limit is reached, beyond which very little more coloring matter is taken up by the fibre. This may be exemplified by the following series, which has been worked out for Crystal Scarlet:

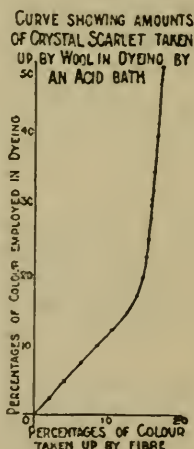
Percentage of color used	50.0	25.0	22.5	20.0	17.5	15.0
Percentage taken by the fibre.	18.2	17.3	17.0	16.6	15.3	14.2
Percentage of color used			12.5	10.0	7.5	2.5
Percentage taken up by fibre			11.9	9.6	7.2	2.2

If a curve is constructed in which the percentages of color used are shown in one coordinate, and the percentages taken up by the fibre on the other, it is seen to follow almost a straight line until the amount of color absorbed reaches about 17 per cent., when it suddenly turns and follows a course almost parallel to one of the coordinates.

The practical results show that when wool is dyed with large excesses of a number of acid colors, the latter are taken up not indiscriminately, but in the proportion of their molecular weights. The view which the author formerly expressed, that chemical processes underlie the dyeing of wool, thus received a strong confirmation. What the nature of these processes is,—whether it be a question of salt formation or condensation in the nucleus, or whether the bodies formed belong to a hitherto unknown class of substances,—he cannot for the present decide. It is quite possible that the process is different from different classes of coloring matter; in fact, this appears to be probable in case of the acid and basic colors.

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The rôle played by the sulphuric acid in dyeing wool with acid colors is usually explained by the assumption that it merely liberates the free color acid from its salt (usually the sodium salt in commercial dyestuffs), which is then taken up by the fibre. That the amount of acid usually employed in dyeing, though theoretically sufficient, is quite inadequate to completely liberate the free color acid has been clearly demonstrated by the beautiful researches of Sisley on the azo dyes. It is further evident from



the behavior of the free color acid of Fast Red A in dyeing. For while this substance is taken up by the fibre in slightly larger amount than its sodium salt, only a thin shade results, and in either case the greater part of this color remains in the bath. It is therefore in another direction that we must look for an explanation. Now, it was shown in a former paper that when wool is boiled in dilute sulphuric acid and then repeatedly in distilled water until no more acid is given up, it can be dyed

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with ordinary acid colors without additions to the bath, yielding fuller shades than when these colors are dyed in the ordinary way. The same thing the author now finds applies to wool which has been boiled in benzine sulphonic acid and then repeatedly in distilled water, and this fact would explain the greater affinity of the free color acid of Fast Red A as compared with its sodium salt. It was further shown on a previous occasion that if the sulphuric acid is taken of sufficient strength to partially disintegrate the wool fibre, the solution is found to contain a substance which precipitates the acid colors, yielding intensely colored lakes. In this case the decomposition of the fibre had, however, resulted in the formation of soluble proteids (lanuginic acid), and no direct comparison with the dyeing process can consequently be made. That, however, the sulphuric acid employed with the acid dyes acts in a sense in the capacity of a mordant (more in the old sense of the word than in the present one) there appears to be no doubt. What the precise nature of this action is, it would be hazardous (considering the defective state of our present knowledge of the substance, or complex of substances of which the wool fibre is composed) to explain. In a former communication the author ascribed the lake formation which takes place in the fibre to the action of lanuginic acid. But it appears doubtful whether a sufficient amount of this soluble degradation product could be formed in the fibre to bind the maximum quantities of dyes which are capable of being taken up. It is, however, quite possible, and in his opinion even probable, that other degradation products are formed in the fibre which, while being insoluble, are intermediate again between the substance of the fibre and lanuginic acid, and possess, like the latter, the property of forming lakes.

The fact that the volume of water used in dyeing these acid colors can be varied between wide limits without having any material influence of the amount of color taken up is *prima facie* evidence that there can be no question here of mere solution taking place in the sense attributed to the expression by Witt.

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That, however, solid solution of the lake may take place in the sense in which the author alluded to in a former discussion, he still holds to be probable. According to his conception it would also account for the transparency of the dyed fibre. Besides, the solubility of the color in water does not appear to bear any relationship to the amount taken up by the fibre, and this would also argue against any pure solution theory.



PART III

Patents for the Year 1904

- I. DYESTUFFS AND COLORING-MATTERS
- II. PROCESSES OF APPLICATION
- III. CHEMICAL PROCESSES
- IV. MACHINES
- V. MISCELLANEOUS



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I.—DYESTUFFS AND COLORING-MATTERS.



DARK BLUE WOOL-DYE AND PROCESSES OF MAKING SAME.

Meinhard Hoffmann, of Frankfort-on-the-Main, Germany, assignor to Cassella Color Company, of New York, N. Y. Patent No. 749,195, dated January 12, 1904.

This invention relates to the production of blue or black coloring-matters dyeing fast shades on wool which are derivatives of the hitherto unknown acetdiamidophenol-sulphonic acid. This acid may be produced in the following manner: On dissolving acetylparaamidophenol in concentrated sulphuric acid a mono-sulphuric-acid is formed in which the sulpho group occupies the ortho position to the hydroxyl. If this acid is nitrated, one nitro group enters into the remaining ortho position. The nitro acid so obtained when cautiously reduced yields the acetdiamidophenol-sulphonic acid of the constitution



If this is treated with nitrous acid, it is transformed into an easily soluble yellow-colored diazo compound which reacts with amines or phenols, forming valuable coloring-matters. If it is, for instance, combined with a hydroxylated derivative of naphthalene—such as beta-naphthol, 1.8 dioxynaphthalene, 4 sulpho-acid, 1.8 dioxynaphthalene, 3.6 disulpho-acid—dyestuffs are obtained

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dyeing wool in an acid-bath dull claret or violet shades, which on being after-treated with chromate are turned into an intense blackish blue. These dyeings are distinguished by their excellent leveling property and are fast to light and milling.

ANTHRAQUINONE DYE AND PROCESS OF MAKING SAME.

Oscar Bally, of Mannheim, Germany, assignor to Badische Anilin und Soda Fabrik. Patent No. 749,913, dated January 19, 1904.

The inventor has discovered that when sulpho-acids of aromatic amins are under suitable conditions condensed with hydroxy-anthraquinone bodies new coloring-matters are formed which are directly soluble in water and which dye unmordanted wool and mordanted wool valuable shades. By "hydroxy-anthraquinone" bodies is understood, in addition to hydroxyanthraquinones themselves, such derivatives thereof as contained halogen. The said condensation may be advantageously carried out in the presence of water by heating the reacting bodies at a sufficiently high temperature.

The claims specify the product which can be obtained by condensing purpurin with suphanilic acid, which dyes chrome mordanted wool blue-violet to blue-black.

GREEN DYE.

Arthur Lüttringhaus, of Ludwigshafen-on-the-Rhine, Germany, assignor to Badische Anilin und Soda Fabrik. Patent No. 750,113, dated January 19, 1904.

The claim is for the coloring-matter containing sulphur, such as can be obtained from methylene-violet, sodium tetrasulphide, carbon disulphide, and alcohol, which dissolves in a water solution of sodium sulphide, which solution dyes unmordanted cotton green, which green on suitable treatment with sulphuric acid and bichromate of potash is changed to blue.

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SENSITIZING DYESTUFF.

Rudolf Berendes, of Elberfeld, Germany, assignor to Farben-fabriken of Elberfeld Company, of New York, N. Y. Patent No. 752,323, dated February 16, 1904.

This invention relates to the production of a new class of dyestuffs which are remarkable on account of their important property to impart greater sensibility to photographic emulsions for distinct colors of the spectrum. They are therefore of great importance for the manufacture of orthochromatic plates, films, or the like.

The process for the production of these new dyestuffs consists in causing caustic alkalies or alkaline earths to act on the ammonium compounds which can be prepared by treating quin-aldin, the homologues or substituted derivatives thereof, with dialkyl sulphates, such as dimethyl sulphate, diethyl sulphate, or the like. One can also employ a mixture of the above-mentioned ammonium bases with one another or with the corresponding derivatives of quinolin, which can be obtained by treating quino-lin with dialkyl sulphates.

The new dyestuffs contain sulphur and are dark crystals having a metallic lustre. They are soluble in chloroform, acetone, and water with a violet color and insoluble in ligroin and ether.

RED AZO DYE.

Paul Julius, of Ludwigshafen-on-the-Rhine, Germany, assignor to Badische Anilin und Soda Fabrik. Patent No. 752,562, dated February 16, 1904.

This invention relates to a new coloring-matter which can be prepared from diazotized sulpho-acid of para-chlor-anilin (which generic term includes both 4-chlor-anilin-5-sulpho-acid and 4-chlor-anilin-6-sulpho-acid) and beta-naphthol.

This new coloring-matter possesses the property of yielding products which are quite insoluble in water or ethyl-alcohol when

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suitably treated with lead acetate, barium chlorid, alumina hydrate, or calcium chlorid.

This coloring-matter may be obtained by diazotizing one (1) molecular proportion of sulpho-acid of para-chlor-anilin in the well-known way and combining this product with one (1) molecular proportion of beta-naphthol in the presence of caustic soda, as usual.

The coloring-matter is difficultly soluble in cold water. With hot water it gives a red solution, which on treatment with caustic soda turns to brown red. The coloring-matter produces a red color with a bluish cast on treatment with concentrated sulphuric acid, which on dilution with water changes to a red with a yellow cast.

On suitable treatment of this coloring-matter with stannous chloride and hydrochloric acid alpha-amido-beta-naphthol and para-chlor-anilin sulpho-acid are produced and may be identified by the tests usual for such purpose.

DYESTUFF.

George Rowland, of Knoxville, Tennessee, assignor to the Rowland Dye Soap Company, of Knoxville, Tennessee. Patent No. 752,804, dated February 23, 1904.

This new compound or article of manufacture is produced by the combination of two materials. A third material may or may not be used. The first of these materials is an anilin dye of the desired color and of that class of anilin dyes known as "neutral" or "sweet" colors, those which are adapted for use in ordinary water substantially without mordant, excepting it be salt (sodium chloride). With the dry anilin a water solution, preferably with hot water, and the solution is preferably a saturated solution, is made.

The second constituent of my compound is soap. This should be "white curd" or "settled" soap. Said soap should be approximately neutral or free from acid or alkali. Salt (sodium chlo-

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ride) may or may not be present in the soap. In the use of settled soap a small quantity of salt solution may be added while mixing in the "crutcher," as hereinafter described.

In general practice the aniline solution may be combined with the soap by any one of three methods: First, while the semisolid soap is being put through the crutcher the dye solution may be added and completely and evenly mixed with the soap; second, while the solidified soap is being put through the "milling-machine" the dye solution may be added and milled in with the soap in the same manner that perfume has heretofore been added to soap; third, the solid soap may be remelted and the dye solution added to the mass and thoroughly mixed by any suitable means.

The three foregoing methods of combining the dye solution with the soap are given as practical means for carrying on the work on a large scale. On a smaller scale the dye may be incorporated with the soap in other ways.

The compound is formed into bars or blocks of any suitable size, or for transportation in quantity the compound may be allowed to solidify in barrels, boxes, or other receptacles.

ANTHRACENE DYE AND PROCESS OF MAKING SAME.

Oscar Bally, of Mannheim, Germany, assignor to the Badische Anilin und Soda Fabrik. Patent No. 753,657, dated March 1, 1904.

It is known that the amido derivatives of anthraquinone and derivatives thereof, as also their substituted amido derivatives and the sulpho-acids of these bodies, can be converted into halogen derivatives by treatment with halogen or halogenizing agents. It is further known that these halogen derivatives react with aromatic amines, giving new coloring-matters.

In this invention halogen-containing products, such as can be obtained by suitable halogenation of either mono- or di-amido- or

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sulpho-acids of the same, are subjected to the action of ammonia or of agents which produce ammonia during the course of the reaction. In this way coloring-matters are obtained which can either be used at once in dyeing or after previous sulphonation, and the dyed goods possess a high degree of fastness. Various products are obtained, according to the quantity of halogen employed in the halogenizing process, as also to the conditions observed during this operation.

ANTHRACENE DERIVATIVE AND PROCESS OF MAKING SAME.

René Bohn, of Mannheim, Germany, assignor to Badische Anilin und Soda Fabrik. Patent No. 753,659, dated March 1, 1904.

In the specification of United States Patent No. 739,579, dated September 22, 1903, is described the production of halogen derivatives of the coloring-matter known in commerce as "indanthrene," these derivatives being prepared by treating indanthrene with halogen or with bodies generating halogen. It is now discovered that by the action of a mixture of nitric acid and hydrochloric acid on indanthrene a new yellowish-brown compound is formed, which may be regarded as chlor-anthraquinone-azine, which on reduction—for example, on treatment with sodium hydrosulphite and alkali—is converted into a chlorindanthrene.

This new yellowish-brown product can be used directly for dyeing in the presence of sodium hydrosulphite and alkali. The dyeings obtained on cotton are a greener blue than those of indanthrene and are extremely fast to chlorin.

ANTHRACENE DYE AND PROCESS OF MAKING SAME.

Heinrich Weltz, of Ludwigshafen-on-the-Rhine, Germany, assignor to Badische Anilin und Soda Fabrik. Patent No. 754,264, dated March 8, 1904.

By the action on anthraquinone-beta-mono-sulpho-acid of con-

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centrated sulphuric acid and mercury or mercury salts in the presence of phosphoric acid or arsenic acid and nitrous acid a new poly-hydroxy-anthraquinone-sulpho-acid can be obtained which is regarded as a "purpurin sulpho-acid" and will hereinafter be referred to as such. The inventor claims that this purpuro-sulfo-acid on being treated with aromatic amido compounds can be converted into valuable coloring-matters which can be directly employed for dyeing. The treatment can be effected in an open or in a closed vessel with or without the addition of a solvent, such as water or alcohol, or of an agent assisting the reaction, such as boric acid, salts of amido compounds, hydrochloric acid, hydrobromic acid, hydrofluoric acid, sulphuric acid, phosphoric acid, benzoic acid, acetic acid, zinc chloride, salts of the aforementioned acids, and the like. As amido-compounds there can be employed aniline, orthotoluidine, para-toluidine, xylidine, para-phenylene-diamine, benzidine, alpha-naphthylamine, beta-naphthylamine, and the like. Suitable temperatures for carrying out the reaction are in general those between 120°-190° C.; but other temperatures may be employed. The products resulting from the reaction may or may not be homogenous.

The resulting dyestuffs dye chromium mordanted wool blue to black shades.

AZO DYE AND PROCESS OF MAKING SAME.

Paul Julius and Ernst Fussenegger, of Ludwigshafen-on-the-Rhine, Germany, assignors to Badische Anilin und Soda Fabrik. Patent No. 754,315, dated March 8, 1904.

The inventors have discovered that by treating one molecular proportion of a monoalkyl para-phenylenediamine with at least two molecular proportions of nitrous acid bodies which may be regarded as para diazo monoalkylphenyl-nitrosamines result and that these combine most smoothly and easily with 1.8 dihydroxynaphthalene 3.6 disulpho acid, whether the combination be effected in presence of caustic alkali, sodium carbonate, or sodium acetate.

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The new coloring-matters so obtained, which still contain a nitroso group, can be fixed as such on the fibre if dyed from a bath but slightly acidified with acetic acid, the shades produced being violet-red; but if dyed in the usual manner in the presence of mineral acid the nitroso group is split off and blue dyeings result. When these dyes are used for dyeing blue shades, it is advantageous to add to the dye-bath bisulphite of soda solution. By heating aqueous solutions of the new nitroso dyestuffs with saponifying agents, such as dilute hydrochloric acid or dilute caustic alkali, the nitroso group is also split off.

These dyestuffs are characterized by containing a nitroso group and yielding on suitable reduction a monoalkylparaphenylenediamine body and amido 1.8 dihydroxynaphthalene 3.6 disulpho-acid.

PROCESS OF MAKING ANTHRAQUINONE DYES.

Eduard Hepp, of Frankfort-on-the-Main, and Ernst Wolpert, of Höchst-on-the-Main, Germany, assigns to Farbwerke vorm. Meister Lucius & Brüning. Patent No. 754,768, dated March 15, 1904.

It is known by United States Patent No. 734,325 that by heating 1:4:5:8 leucotetraoxyanthraquinone with primary aromatic amines in presence of salts thereof, dialphylidodioxyanthraquinones are obtained, which in their sulphonated form dye chrome mordanted or unmordanted wool fast green shades.

The new process consists in the production of blue coloring-matters from said leucotetraoxyanthraquinone by condensing it with the sulpho-acids of primary aromatic amines.

In carrying out this process it is necessary to employ the sulpho-acids—(such as sulphanilic acid, metanilic acid, paratoluidin-sulpho-acid [CH_3 : NH_2 : SO_3H = 1: 4: 6], para-amidobenzyl-sulpho-acid and so on)—in the form of their salts or together with suitable acetates, such as the acetates of alkalies. The sulpho-acids are thus heated with the leucotetraoxyanthraquinones in presence of a condensing agent, such as boric acid, and of a

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suitable solvent—such as water, acetic acid, glycerin, acetin, and so on—and after the condensation having taken place the melts are diluted with water and the dyestuffs are precipitated from their aqueous solutions with common salt or in another suitable manner. The dyestuffs thus obtained are, when dry, dark-blue powders, soluble in water and ammonia with a blue color. They dye chrome mordanted and unmordanted wool very fast blue shades.

The claim specifies the product from sulphanilic acid.

RED-VIOLET AZO DYE.

August Dorrer, of Ludwigshafen-on-the-Rhine, Germany, assignor to the Badische Anilin und Soda Fabrik. Patent No. 754,856, dated March 15, 1904.

This invention is based on the discovery that the diazo compounds of 1.4-naphthylamine sulpho-acid, 2.8-naphthylamine-sulpho-acid, sulphanilic acid, or metanilic acid, can be combined with 1.8-naphthylene-diamin to form coloring-matters of technical value. The coloring-matters thus produced can be directly employed for dyeing, or they can be further treated with nitrous acid, in which case azimid bodies result. As a rule, however, the tinctorial properties of the coloring-matters are not altered by this treatment to any great extent.

The new coloring-matters when dry are dark powders, soluble in water, yielding yellow-red to red-violet solutions. They dye animal fibre from the acid-bath violet-brown to red-violet shades, which on treatment with potassium bichromate become brown.

The specific coloring-matter from 1.4-naphthylamine-sulpho-acid and 1.8-naphthalene-diamin when dry is a dark powder, soluble in water, yielding a red-violet solution and is also soluble in concentrated sulphuric acid, yielding a blue solution. It dyes animal fibre from the acid-bath a red-violet shade, which on treatment with potassium bichromate turns brown.

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BLUE-SULPHUR DYE AND PROCESS OF MAKING SAME.

Julius Abel, of Mannheim, and Arthur Lüttringhaus, of Ludwigshafen-on-the-Rhine, Germany, assignors to the Badische Anilin und Soda Fabrik. Patent No. 755,428 dated March 22, 1904.

This invention has for its object the production of a new class of blue substantive coloring-matter containing sulphur, which is distinguished from all others by directly dyeing cotton from a bath containing sodium sulphide blue shades and by dissolving completely in dilute caustic-soda lye, containing about five (5) per cent. of NaOH, yielding a blue solution from which the coloring-matter is not precipitated by blowing in pure air, but from which it is precipitated by blowing in sufficient carbonic-acid gas.

To obtain the new coloring-matter, a mixture of a thiazin, such as methylene-violet and phenol as initial material, is used, and this mixture is treated under suitable conditions with sulphur and sodium sulphide or other agent acting in a similar manner. Instead of methylene-violet, various bodies, which for the purposes of this invention are regarded as equivalent to methylene-violet, can be employed. As instances of such, are the analogues of methylene-violet, alkylated indophenols—obtainable, for example, by oxidizing alkyl-para-phenylene-diamine with phenol—or a suitable derivative of an alkylated indophenol or the corresponding diphenylamine body; further, a thiosulphonic acid of said indophenol.

BLACK DYE AND PROCESS OF MAKING SAME.

René Bohn, of Mannheim, Germany, assignor to Badische Anilin und Soda Fabrik. Patent No. 756,571, dated April 5, 1904.

In the specification United States Patent No. 661,438, of November 6, 1900, there has been described the production of a naphthazarine intermediate product. In itself this intermediate product has not hitherto proved of use as a coloring-matter. The inventor has now discovered that by treating this intermediate

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product with a thiosulphate, such as sodium thiosulphate, under suitable conditions—for example, in the presence of dilute mineral acid—coloring-matter can be obtained which possesses valuable properties. For the preparation of the new coloring-matter naphthazarine melts as obtained according to the aforesaid specifications can be advantageously employed.

The coloring-matter so obtained dyes unmordanted wool violet, which becomes green black on being subsequently treated on the fibre with potassium bichromate and acetic acid in the known manner. It dyes chrome mordanted wool bluer shades of black. On heating the coloring-matter with sodium bisulphite or with sodium sulphite a body soluble in water and yielding a brown solution is obtained, which body when printed on cotton with chromium acetate furnishes green-black shades.

BLUE-RED LAKE AND PROCESS OF MAKING SAME.

Gillis Gullbransson, of Höchst-on-the-Main, Germany, assignor to Farbwerke, vorm. Meister, Lucius & Brüning. Patent No. 757,109, dated April 12, 1904.

This invention relates to the manufacture of color-lakes (pigment colors) by precipitating, by methods well known in the preparation of this class of colors, the mono-azo dyestuff obtained by the action of diazotized orthoamidobenzoic acid and the sodium salt of beta-naphthol-disulphonic acid R. The lakes produced are remarkably fast to light, in which regard they surpass the lakes derived from the phthalic-acid dyestuffs (eosines), while approximating these in beauty and brilliancy of tint. The manufacture is effected, as usual, by suspending or mixing the substratum in water and adding thereto the diazotized orthoamidobenzoic acid and the sodium salt of beta-naphthol-disulphonic acid R and then precipitating by addition of the precipitant dissolved or suspended in water or the substratum may be added after precipitation of the dyestuff with the precipitant. It is also practicable to pro-

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duce the substratum at the same time that the color-lake is being precipitated. Again, the process may be that described in English Patent No. 5,167/01, in which lakes insoluble in water are obtained by selection of a suitable hydroxide.

GLUCOSIDE DYE AND PROCESS OF MAKING SAME.

Francis J. Oakes, of New York, N. Y. Patent No. 759,008, dated May 3, 1904.

The objects of the present invention are to produce dyes and coloring-matters from dyewoods free or comparatively free from the undesirable ingredients referred to as resulting from oxidation and also a process whereby such articles may be readily, successfully, and economically manufactured. The results are obtained by the use of an improved process of extraction, a characteristic and essential feature of which consists, in bringing into the presence of the glucoside of the coloring-matter at what may be termed its nascent stage—that is to say, as it begins its infusion from its original vegetable container into the watery leach—carbonic-acid gas (CO_2) and afterwards preferably continuing this association during the processes of extraction or leaching under conditions which will admit the chemical combination of the glucoside with the carbonic-acid gas as a radical.

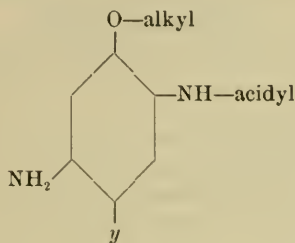
It seems that by reason of this process the glucoside extracted from logwood forms with the carbon-dioxide radical a new compound or substitution product containing said dioxide as a radical, which substitution product may be properly designated as "hematoxyline carbonate."

BLUE AZO DYE AND PROCESS OF MAKING SAME.

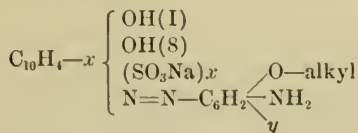
Karl Jagerspacher and Thilo Kröber, of Basle, Switzerland, assigns to the firm of Society of Chemical Industry in Basle. Patent No. 759,284, dated May 10, 1904.

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The invention relates to the manufacture of blue monoazo dyestuffs derived from peridioxynaphthalenesulphonic acids and from diazo derivatives of the monoacidylamidophenol-ether of the general formula



(in which y may be an alkyl radical, chlorine, or other halogen, SO_3H , CO.OH , etc.)—as, for instance, monoacidyl-2:5-diamidopararesolethers, monoacidyl-2:5-diamidopara-chlorophenolethers, etc. These dyestuffs are amidoazo dyestuffs of the general formula:



(y having the same significance as in the preceding formula.) For the manufacture of the dyestuffs one molecule of one of the said monoacidylamidophenolethers is diazotized, the resulting diazo derivative, combined with one molecule of a sulphoacid of 1:8-dioxynaphthalene in an aqueous solution containing acetic acid or sodium carbonate and the acidyl group of the acidylamidoazo dyestuff thus obtained, is finally eliminated by boiling with saponifying agents—as, for instance, soda-lye. The amidoazo dyestuffs thus obtained are powders of bronze lustre, which are

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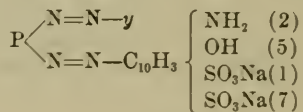
easily soluble in water with blue color. They dye wool in an acid-bath in pure-blue tints fast to light and to alkali.

VIOLET TETRAZO DYE AND PROCESS OF MAKING SAME.

Karl Jedlicka, of Basle, Switzerland, assignor to the firm of Society of Chemical Industry in Basle. Patent No. 759,613, dated May 10, 1904.

This invention relates to the manufacture of new tetrazo dyestuffs by the combination of one molecule of the tetrazo derivative of a paradiamine of the diphenyl series with two molecules of naphtholic compounds, of which one at least is the 2.5.1.7-amidonaphtholdisulphonic acid ($\text{NH}_2:\text{OH}:\text{SO}_3\text{H}:\text{SO}_3\text{H} = 2:5:1:7$).

The new dyestuffs correspond to the general formula:



wherein P stands for the radical "diphenyl," "ditolyl," etc., and y for a naphtholic compound—as, for instance, an amidonaphtholsulphonic acid, an amidonaphtholdisulphonic acid, an α -naphtholsulphonic acid, a betanaphtholsulphonic acid, an oxynaphthoic acid, etc. These dyestuffs are in dry state dark powders with metallic luster. They dissolve in water with red-violet to blue coloration and dye cotton without mordant from violet to blue. They may be diazotized in substance or on the fibre and then be combined with developers. The greatest interest attaches to the tints obtained by development on the fibre with betanaphthol, which are indigo-blue and very fast to washing, and with metatoluylenediamine, which are black and also very fast to washing.

The claims specify the dyestuff from benzidine and 2.5.1.7 amidonaphtholdisulphonic acid.

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RED BASIC RHODAMIN DYE AND PROCESS OF MAKING SAME.

Augustus Bischler, of Basle, Switzerland, assignor to Basle Chemical Works. Patent No. 759,657, dated May 10, 1904.

The inventor has found that by heating the rhodamine bases (phthaleins of meta-amido-phenol and its derivatives) with derivatives of halogenated fatty acids, new red basic dyestuffs are obtained which are easily soluble in water and well suited for dyeing cotton, silk, and wool. The new dyestuffs are obtained in a smooth manner by heating the rhodamine bases with the derivatives of halogenated fatty acids alone or in presence of a diluent, such as alcohol, glycerine, etc.

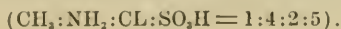
The claims specify the product from unsymmetrical dimethyl-methyl-rhodamine base (produced from one molecule dimethyl-amido-oxybenzoyl-benzoic acid and one molecule m-amidocresol and chloracetamid, constituting in dry state, a greenish-red crystalline powder, easily soluble in water giving a red solution of a slight fluorescence, dyeing cotton, silk and wool red tints and developing ammonia on heating with soda-lye.

RED AZO DYE.

Paul Julius, of Ludwigshafen-on-the-Rhine, and Siegfried Haackel, of Mannheim, Germany, assignors to Badische Anilin und Soda Fabrik. Patent No. 759,716, dated May 10, 1904.

This invention relates to the production of new azo coloring-matter which is especially suitable for use in the form of its lakes.

The material from which new azo coloring-matter is made is ortho-chlor-para-toluidin monosulpho-acid, which can easily be obtained by the sulphonation of ortho-chlor-para-toluidin. The sulpho-acid is new; but most probably the sulpho group occupies the ortho position to the amido group



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This sulpho-acid when acted on by nitrous acid yields a diazo compound which is difficultly soluble in water and when combined with beta-naphthol yields a red azo coloring-matter.

The new coloring-matter thus obtained in the form of its sodium salt is a red compound difficultly soluble in hot water, and the free acid itself is practically insoluble in hot water. It is specially suitable for the preparation of lakes, as its salts (and in particular its calcium, barium, aluminium, and lead salts) are characterized by their insolubility even in boiling water and by their brilliant scarlet-red shades, which are fast against the action of acid, alkali, or light. Upon reduction the new compound yields the original ortho-clor-para-toluidin sulpho-acid again, together with amido-beta-naphthol.

ORANGE SULPHUR DYE.

Wilhelm Emmerich, of Höchst-on-the-Main, Germany, assignor to Farbwerke, vorm. Meister, Lucius & Brüning. Patent No. 760,110, dated May 17, 1904.

The inventor has found that if the known toluylene diurea obtained by combining the hydrochloride of metatolylenediamine (1:2:4) with potassium cyanate be heated with sulphur a dye-stuff is obtained which dyes cotton an orange color in an alkaline sulphide bath.

The dyeings obtained with the alkali-sulphide solution are of orange color fast to light and soap and do not change even when boiled with sodium carbonate or a solution of acids.

CHLORINATED INDIGO AND PROCESS OF MAKING SAME.

Paul Erwin Oberreit, of Ludwigshafen-on-the-Rhine, Germany, assignor to Badische Anilin und Soda Fabrik. Patent No. 761,007, dated May 24, 1904.

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This invention relates to new indigo coloring-matters containing chlorine and process of producing same. These products will hereinafter be referred to by the generic term "chlorinated indigo."

The process employed in this invention consists, essentially, in converting chlorinated phenyl-glycocoll-ortho-carboxylic acid into, for instance, acetylated chlor-indoxyl derivatives, and finally converting these products into the corresponding chlorinated indigo coloring-matters. This can be carried into practical effect by treating a chlor-phenyl-glycocoll-ortho-carboxylic acid (preferably in the form of its sodium salt) with, say, acetic anhydrid, acting on this result (preferably in the dry and purified state) with, say, caustic-soda solution, and then blowing air through the liquid thus obtained.

The chlorinated phenyl-glycocoll-ortho-carboxylic acid employed can be obtained by direct chlorination of phenyl-glycocoll-ortho-carboxylic acid itself or by chlorinating the nitril of that acid—namely, cyan-methyl-anthranilic acid, which is described in U. S. Patent No. 662,754, dated November 27, 1900—and subsequently converting the product obtained in this way into chlorinated phenyl-glycocoll-ortho-carboxylic acid by suitable saponification.

PREPARATION OF AZO DYES.

Walther Loeb, of Bonn, Germany, assignor to C. F. Boehringer & Söhne. Patent No. 761,310, dated May 31, 1904.

The inventor claims to manufacture azo dyes electrochemically in one process by combining diazotation and coupling of the amine with a compound of acid character in the same solution under the influence of the electric current. The principle of the operation depends upon the discharge of NO_2 anions in a nitrite bath at the anode. When an amin is present, diazotation of said amin takes place. The diazo compounds so formed are, however, very unstable under these circumstances for the reason that the oxidizing

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effect of the current, the solution itself, and the resulting higher temperature all combine to rapidly decompose diazo bodies. By employing coupling compounds in connection with the above diazotizing reaction on an amine a stable azo dye can be obtained. If one of the first class of coupling compounds having an acid character is present when the above diazotation of the amine takes place, such coupling compound will combine at once with the diazo compound which is formed, producing thereby the corresponding azo compound or dye. The amines cannot be used in this process for the purpose of coupling, since they are by their properties and character naturally subject to the action of the discharged NO_2 ions or, in other words, to diazotation. The process may be explained by assuming that the reaction of coupling takes place at a much greater rate than the decompositions of the diazo bodies, as mentioned above.

PROCESS OF MAKING INDOXYL, ETC.

Augustus Bischler, of Basle, Switzerland, assignor to Basle Chemical Works. Patent No. 761,440, dated May 31, 1904.

By melting phenylglycin salts with caustic alkalies only about eight to ten per cent. of indoxyl is formed. A little more indoxyl is obtained by heating a mixture of phenylglycin salt, caustic alkali, and sodium alcoholate; but the yield of indigo is much too small to be of any technical use.

The inventor has found that a much better yield of indoxyl is obtained by not employing simply sodium alcoholate for the condensation of the phenylglycin salt to indoxyl, but a product obtained by dissolving sodium in an equivalent quantity of an alcoholic solution of caustic potassium hydroxide (caustic potash) and distilling off the alcohol *in vacuo*. The condensing effect of such a product is further increased by an addition of metallic sodium and eventually of small quantities of some slightly reducing substances, such as sodium sulphite. The small quantities

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of sulphite probably have a conserving influence on the alcoholate, thus increasing its efficiency.

The phenylglycin salt may be replaced by the alkali salts of other arylglycins or of the derivatives of arylglycins, whereby the corresponding indoxyl derivatives are formed. The reaction product of sodium on alcoholic caustic potash has also a very good condensing effect on the arylglycin compounds and their derivatives—such as phenylglycin-anilid, phenylglycin-phenylglycid, alpha-phenylhydantoins, etc., thus forming indoxyl or homologues of indoxyl.

BLUE SULPHUR DYE AND PROCESS OF MAKING SAME.

Ernst Mathe, of Höchst-on-the-Main, Germany, assignor to Farbwerke, vorm. Meister, Lucius & Brüning, of Höchst-on-the-Main, Germany. Patent No. 763,193, dated June 21, 1904.

Diparaoxyphenyl-para-para₁-diamidodiphenylamine crystallizes when pure in the form of colorless leaflets, which melt at about 208° C. This substance may be obtained by simultaneously oxidizing para-para₁-diamidodiphenylamine and phenol or diphenylamine and para-amidophenol, both in molecular proportions of one to two, or by the action of quinonechlorimid on diphenylamine in molecular proportions of two to one. In any of these cases indophenol is obtained, which on being reduced yields dipara-oxyphenyl-para-para₁-diamidodiphenylamine.

By heating this with sodium sulphide and sulphur for some time to 100° to 120° C. and in precipitating the dyestuff thus obtained from the mass diluted with water, a blue dyestuff is obtained which is a dark blue powder of metallic lustre, insoluble in water, alcohol, ether, benzine, glacial acetic acid, and dilute acids, soluble in dilute alkali lye with a blue, in concentrated sulphuric acid with a green color; the green solution of the dyestuff in sodium-sulphide solution dyeing cotton fast indigo-blue shades.

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ANTHRACENE DYE AND PROCESS OF MAKING SAME.

Heinrich Weltz, of Ludwigshafen-on-the-Rhine, Germany, assignor to Badische Anilin und Soda Fabrik. Patent No. 763,233. dated June 21, 1904.

The inventor has discovered that the polyhydroxy-anthraquinone sulpho-acid, which can be obtained by acting on anthraquinone-beta-mono-sulpho-acid with concentrated sulphuric acid, mercury, or mercuric salts, and nitrous acid in the presence of arsenic acid or phosphoric acid, can be condensed with ammonia, giving rise to a new amido-dihydroxy-anthraquinone sulpho-acid. The conditions under which this condensation can be carried out—for instance, the concentration of the ammonia and the temperature—may be considerably varied without departing from the nature of my invention. This new amido-dihydroxy-anthraquinone sulpho-acid produces fuchsin shades on unmordanted wool, bluish-red shades on wool mordanted with alumina, and brown-violet shades on chrome-mordanted wool.

PROCESS OF MAKING SULPHUR DYES.

Alcide François Poirrier, of Paris, France, assignor to Sté. Ame. des Maitières Colorantes et Produits Chimiques de St. Denis. of Paris, France. Patent No. 763,320, dated June 21, 1904.

The inventor has already prepared blue and blue-violet coloring-matters by the action, under particular conditions of temperature, of the product obtained by the combination of sulphur chloride on phenol or the cresols or commercial cresol on certain diphenylamines or indophenols. This reaction has now been applied to other combinations of phenols or of diphenylamines under similar conditions of procedure; but instead of using an indophenol obtained by oxidizing paraphenylene diamine and a phenol, as heretofore, an indophenol obtained from an alkylated paraphenylenediamine is used, and preferably the one from dimethylated paraphenylenediamine.

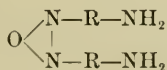
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For the indophenol of dimethylparaphenylenediamine above mentioned may be substituted the same indophenol from ortho or meta cresol, and for the product of the reaction of sulphur chloride on the cresols may be substituted the product of the reaction of sulphur chloride on phenol.

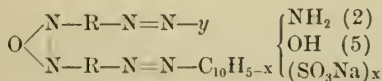
ORANGE TETRAZO DYE AND PROCESS OF MAKING SAME.

Karl Jedlicka and Arnold Schedler, of Basle, Switzerland, assignors to the firm of Society of Chemical Industry in Basle. Patent No. 763,761, dated June 28, 1904.

This invention relates to the manufacture of valuable new tetrazo dyestuffs by the combination of one molecule of the tetrazo derivative of an azoöxyamine of the formula



(wherein R designates an aliphyl radical, as C_6H_4 , C_6H_5 , CH_3 , $\text{C}_6\text{H}_2(\text{CH}_3)_2$, etc.) with two molecules of phenolic compounds, of which one at least is a sulpho derivative of the 2.5-amidonaphthol—as, for instance, the amidonaphtholmonosulphonic acid ($\text{NH}_2\text{:OH:SO}_3\text{H} = 2:5:7$) or the 2.5.1.7-amidonaphtholdisulphonic acid ($\text{NH}_2\text{:OH:SO}_3 = 2:5:1:7$). These new dyestuffs correspond to the general formula



R having the same significance as in the preceding formula and y representing a phenolic compound—as, for instance, the 2.5.7-amidonaphtholmonosulphonic acid, the 2.5.1.7-amidonaphtholdisulphonic acid, a sulpho derivative of alpha-naphthol, a sulpho

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derivative of beta-naphthol, the salicylic acid, an oxynaphthoic acid, etc. They constitute red to red-brown powders, which dissolve in water with an orange to orange-red color and dye unmordanted cotton in a salt bath orange to orange-red shades. By diazotizing these new dyestuffs on the fibre and developing subsequently with beta-naphthol valuable bright bordeaux-red shades fast to washing are obtained.

BLACK SULPHUR DYE AND PROCESS OF MAKING SAME.

Richard Lauch, of Uerdingen, Germany. Patent No. 764,733, dated July 12, 1904.

This invention relates to the production of a black-dyeing cotton dyestuff.

According to German Patent No. 105,632 paraamidodinitrodiphenylamine, obtained by the condensation of para-phenylenediamine with 1.3.4. dinitrochlorbenzene, gives by melting with sulphur and alkaline sulphides a black sulphur dye corresponding to the dyestuff, deriving from trinitro diphenylamine, which substance is obtained by the condensation of aniline with 1.3.4. dinitrochlorbenzene and further nitration. For the production of this black dyestuff temperatures of 220° to 240° are demanded. The inventor claims that this statement is not right, because paraamidodinitrodiphenylamine under the conditions of the said specification yields an olive dyestuff, while trinitrodiphenylamine gives a gray black one and that amidodinitrodiphenylamine, if heated at temperatures not far over 180°, a shorter or longer time, yields dark-blue to black dyestuffs, under which conditions trinitrodiphenylamine gives always the same gray-black dye. The black dye from amidodinitrodiphenylamine differs from the black obtained from the trinitrodiphenylamine, as it dyes unmordanted cotton in cold or hot bath containing sodium sulphide and salt in deep black shades already sufficiently fast, becoming bluer by further treatment with bichromate and sulphate of copper.

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DIRECT COTTON SULPHUR DYE AND PROCESS OF MAKING SAME.

Richard Lauch, of Uerdingen, Germany. Patent No. 764,734, dated July 12, 1904.

If paraamidodinitrophenylamine obtained by the condensation of paraphenylendiamine with 1.3.4. dinitrochlorbenzene is boiled in a reflux-boiler with a watery solution of sodium sulphide and sulphur, there will be a slow and incomplete transformation of the paraamidodinitrodiphenylamine to a valuable dyestuff. A heating of twenty-four hours gives a reddish-brown solution and a hard insoluble mass is separated; but if a higher temperature of the solution than 110° C. is employed, which temperature is obtained by the evaporation of the greatest part of water, then the solution raised from 110° to 115° to 125° C. and then the melt allowed to boil in a reflux-boiler, a heating of about thirty to thirty-six hours will give a complete transformation of the insoluble paraamidodinitrodiphenylamine to a very valuable dyestuff. The formed dyestuff, which is partly separated, dissolves easily and completely with a clear violet color and dyes cotton directly dark violet-blue. If to the melt a dissolving agent like glycerine is added, there will be obtained a quicker formation of the dyestuff. A heating of twenty hours will be sufficient, and the formed dyestuff will dissolve in the melt. Boiling for more than twenty hours will give a dark-blue color, and a boiling, for instance, of forty hours will produce black. The longer the heating the faster the dyestuff will become, and the color will change from blue to black.

PROCESS OF MAKING SULPHUR DYES STABLE.

Richard Lauch, of Uerdingen, Germany. Patent No. 764,735, dated July 12, 1904.

The following is an example of the manner of carrying out this process: The black dyestuff prepared by melting para-amido-dinitro-diphenylamine with sulphur and alkaline sulphide, de-

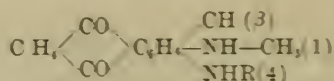
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scribed in United States Patent No. 764,733, is spread in a powdered state in moderately thick layers and repeatedly turned over, especially when a high temperature has been reached. The greatest increase of temperature shows itself on the second day. If about ten per cent. of moisture is added by means of water to the powder, the temperature rises at once to 40° and in a short time to 100°. If not moistened, the dyestuff shows a rise of temperature only after about one day's exposure. When a normal condition has been reached, complete oxidation has occurred and the dyestuff may be considered permanent. The dyestuffs thus obtained form a black powder, are little hygroscopic, difficultly soluble in water, but easily soluble with addition of alkaline sulphides, form green to bluish color. Cotton is dyed a deep black in an alkaline bath containing common salt, which shades are advantageously influenced by subsequent treatment with metallic salts.

BLUE ANTHRAQUINONE DYE.

Wilhelm Berchemmann, of Elberfeld, Germany, assignor to Farbenfabriken of Elberfeld Co. Patent No. 764,837, dated July 12, 1904.

This invention relates to the manufacture of new blue dyestuffs of the anthraquinone series, being sulphonic acids of methylamidoaldehydamido-beta-methylanthraquinone, having most probably the following general formula:



(R meaning in this formula an aliphyl radical, such as phenyl, tolyl, xylyl, or the like.) The said anthraquinone derivatives can be obtained, for instance, by first treating methyl-amido-beta-methylanthraquinone (obtainable from monitro-beta-methyl-

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anthraquinone and methylamine) with bromine; second, condensing the resulting monobromo-methyl-amido-beta-methylanthraquinone with aromatic amines—such as aniline, paratoluidine, xylidine, or the like—and finally treating the methylamidoal-
phylamido-beta-methylanthraquinones thus obtained with sulphonating agents. The new dyestuff sulphonic acids thus produced are in the shape of their alkaline salts dark powders soluble in water with a blue color. They dye unmordanted wool from acid-baths blue shades.

RED AZO COLOR.

Paul Julius and Carl Winter, of Ludwigshafen-on-the-Rhine, Germany, assignors to Badische Anilin und Soda Fabrik. Patent No. 765,079, dated July 12, 1904.

The inventors have discovered that by combining diazotized ortho-chlor-para-toluidin with beta-naphthol-3.6-disulpho-acid a red coloring-matter is obtained which is eminently suitable for the preparation of lakes which possess an excellent fastness against the action of light.

The new coloring-matter, in the form of its sodium salt, is brilliant red and difficultly soluble in cold water, but easily soluble in hot water. Its barium lake is also brilliant red and practically insoluble in water. Upon reduction with zinc-dust in solutions containing ammonia this coloring-matter yields ortho-chlor-para-toluidin and amido-naphthol-disulpho-acid.

YELLOW-RED AZO COLOR.

Paul Julius and Franz Osthelder, of Ludwigshafen-on-the-Rhine, Germany, assignors to Badische Anilin und Soda Fabrik. Patent No. 765,080, dated July 12, 1904.

The inventors have discovered that a brilliant orange coloring-matter can be obtained by combining diazotized ortho-chlor-para-toluidin with beta-naphthol, which coloring-matter is insoluble in water and very fast against the action of lime and of light

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and is therefore valuable for dyeing and printing on cotton and also for the preparation of lakes. The coloring-matter can be produced on the fibre by subjecting material which has been treated with an alkaline solution of beta-naphthol (with or without the addition of Turkey-red oil or a similar substance) to the action of the diazotized chlor-toluidin, or the coloring-matter can be produced as such by combining the diazo compound with an alkaline solution of beta-naphthol. In this case it is convenient to previously mix the solution of beta-naphthol with Turkey-red oil or oleic acid or soap or a body of a like nature, with or without the addition of one or more of the substrata which can be used in the preparation of lakes—for instance, hydrate of alumina or heavy spar.

The new coloring-matter is practically insoluble in water. It is yellowish red and also yields a yellowish-red lake when mixed with barium sulphate.

Upon gentle reduction the coloring-matter yields ortho-chlor-para-toluidin and amido-naphthol.

AZO DYE AND PROCESS OF MAKING SAME.

Paul Julius and Siegfried Haeckel, of Ludwigshafen-on-the-Rhine, Germany, assigns to Badische Anilin und Soda Fabrik. Patent No. 765,581, dated July 19, 1904.

The object of this invention is the production of azo dye of the naphthalene series which gives black shades on wool when, after dyeing in the usual way from an acid-bath, the material is subsequently treated with a chromate or a mixture of a chrome salt and a chromate.

To obtain the new azo dye, the acetyl compound of 2,4-dichlor-1-naphthylamine is treated with fuming sulphuric acid. Then the acetyl group is split off and a new 2,4-dichlor-1-naphthylamine sulpho-acid is obtained. If this new monosulpho-acid be diazotized, a diazo compound is obtained which can be recognized by testing it with a solution of resorcinol made alkaline with car-

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bonate of soda in that under these conditions a yellowish-red azo coloring-matter is obtained; but if this new diazo compound before coupling with the resorcinol be treated with a solution of a body that binds mineral acids—such as, for instance, sodium acetate or the carbonates of the alkalies or alkaline earths—then the diazo compound is changed to a different one, which on testing with the soda-alkaline resorcinol solution yields a deep violet coloring-matter. Similarly, the diazo compound first obtained gives a red dye with beta-naphthol; but the diazo compound obtained after treatment with the reagents defined yields with beta-naphthiol a dyestuff which is soluble in water, giving a brilliant blue solution, which dyes wool from the acid-bath in the first place brown-violet shades which upon treatment with bichromate of potash or a mixture of a chromate and a chromium salt in the known manner are converted into a deep blue-black with a beautiful “overhand” appearance. The wool thus dyed possesses to an excellent degree the character of fastness against the action of washing, milling, potting, and light.

MANUFACTURE OF BROMINATED INDIGO.

Albrecht Schmidt and Rudolf Müller of Höchst-on-the-Main, Germany, assignors to Farbwerke, vorm. Meister, Lucius & Brüning. Patent No. 765,996, dated July 26, 1904.

The present application relates to the manufacture of bromo-indigo by electrolysis of an aqueous or sulphuric-acid suspension of indigo or indigo-white treated with hydrogen bromide, sodium bromide, or other bromates. However, it is not absolutely necessary to use a diaphragm, as the electrolytical hydrogen has no action in an acid solution on indigo and bromo-indigo. The advantage of this method consists, therefore, in that only small portions of bromine act on an excess of indigo, for with proper choice of the current conditions no excess of bromine can be employed, and in that no regeneration of hydrogen bromide is necessary.

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To obtain good yields, it is requisite to operate with not too dilute acids, for otherwise too many products of oxidation are obtained—for example, bromo-isatine. Hydrobromic acid of forty per cent. strength or more or sulphuric acid of fifty to seventy-eight per cent. strength, containing hydrogen bromide, yield good results. Also concentrated hydrochloric acid may be used as electrolyte, if sufficient hydrobromic acid is present; but its use with electrolysis is somewhat inconvenient.

The process is the same with indigo-white. Here, too, a diaphragm may be used or not. Also bromides, such as sodium bromide, may be added during electrolysis.

The brominated indigos thus obtained resemble in their properties those obtained by dry bromination, German Patent No. 128,575; but whether they are identical with the latter or with that obtained synthetically—for instance, from indoxyl—could hitherto not be determined.

ORANGE DYE AND PROCESS OF MAKING SAME.

Otto Sohst, of Höchst-on-the-Main, Germany, assignor to Farbwerte, vorm. Meister, Lucius & Brüning. Patent No. 766,540, dated August 2, 1904.

The inventor has found that the yellow to orange-yellow dyestuffs or their leuco compounds obtained by the interaction of monochloro-acetic acid or its alkylesters and acridine-yellow or its leuco compound or by directly heating the base of tetramidoditolylmethane with mineral acid and monochloroacetic acid or its alkylesters and which may be called "glycinacridines" may be transformed by further treatment with mineral acids and alcohols into more valuable orange to orange-red dyeing products. The constitution of this class of dyestuffs cannot as yet be defined. When dry, they are brown-red powders, yielding on leather or cotton mordanted with tannin orange to orange-red shades. They are readily soluble in water with an orange color, but soluble with difficulty in alcohol and insoluble in ether, benzine, or ligroin. In

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concentrated sulphuric acid they dissolve a yellow solution of green fluorescence. The further alkylation occurs best according to U. S. Patent No. 739,117 by the action of alcohol on the dilute solution of the hydrochloride of the leuco compounds.

DARK-BROWN WOOL-DYE.

August Leopold Laska, of Offenbach-on-the-Main, Germany, assignor to firm of K. Oehler, Anilin und Anilinfarben Fabrik. Patent No. 767,069, dated August 9, 1904.

This invention relates to the manufacture of monoazo dyes by combining sulpho-conjugated diazonaphthalenes with meta-oxydiphenylamine. These dyestuffs yield on wool dyed in the usual manner and subsequently treated with chromic compounds acting as oxidizing agents dark-brown shades of valuable properties.

The claims specify the dyestuffs obtained by combining the sulphonic acids of the alpha-diazonaphthalene with meta-oxydiphenylamine.

BROWN MORDANT DYE.

August Leopold Laska, of Offenbach-on-the-Main, Germany, assignor to the firm of K. Oehler, Anilin und Anilinfarben Fabrik. Patent No. 767,070, dated August, 9, 1904.

In U. S. Patent 767,069 are described mordant dyes which result from coupling sulpho-conjugated diazonaphthalenes with m-oxydiphenylamine. Further investigations have led to the discovery that still more valuable dyestuffs are obtained by combining the sulphonic acids of heteronuclear diazonaphtholes with m-oxydiphenylamine. These dyestuffs yield on wool when dyed in an acid-bath orange to violet shades, which turn into reddish brown to brownish violet on a subsequent treatment with chromium compounds acting as oxydizing agents and which are distinguished by a prominent fastness to light, milling, and potting. In order to enable a most easy course of the formation of the dyestuff, it is advisable to carry out the combination of the diazo-naphthol-

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sulphonic acid with the m-oxydiphenylamine in a weakly acid solution.

The following are the results of various combinations by the above process:

Dyestuff from m-oxydiphenylamine combined in an acid solution with the diazo compound from—	Dyes wool—	
	From an acid bath.	On subsequently treating with a chromium compound.
2.5-amidonaphthol-7-sulphonic acid.	Reddish brown ...	Dark brown.
2.8-amidonaphthol-6-sulphonic acid.	Orange	Dark reddish brown.
1.5-amidonaphthol-6-sulphonic acid.	Yellowish brown .	Yellowish dark brown.
2.5-amidonaphthol-3-6-disulphonic acid	Reddish brown ...	Dark reddish brown.
1.8-amidonaphthol-3-6-disulphonic acid	Reddish violet....	Brownish violet.

ANTHRACENE DYE.

René Bohn, of Mannheim, Germany, assignor to the Badische Anilin und Soda Fabrik. Patent No. 767,259, dated August 9, 1904.

In the specifications of U. S. Patents Nos. 682,523 and 739,145 there is described the production of blue and yellow coloring-matters obtained from beta-amido-anthraquinone by oxidation or fusion with caustic potash. These coloring-matters are known under the names "indanthrene" and "flavanthrene," and can only be used for dyeing and printing when a special process is employed.

The inventor has now discovered that by melting diamido-anthraquinone bodies with caustic potash coloring-matters can be obtained which have bluish-gray to reddish-gray shades, and which can be employed for dyeing and printing by means of the same special process. The diamido-anthraquinone bodies at present found suitable are the 1.5, 1.8, 1.3, 2.6, and 2.7 diamido-anthraquinones and also their sulpho-acids.

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The coloring-matters obtained from the diamido-anthraquinone sulpho-acids are when dry brownish-black powders and possess the same general characteristics as do the coloring-matters obtainable from the unsulphonated diamido-anthraquinones. They all possess (with the exception of their shades) similar properties to indanthrene and probably belong to the same class of chemical compounds. In particular they possess the same extraordinary degree of fastness, which exceeds that of all other classes of coloring-matters.

GLYCOLLIC ACID ANILID-ORTHO-CARBOXYLIC ACID AND PROCESS OF MAKING INDIGO.

Benno Homolka, of Frankfort-on-the-Main, and Friedrich von Bolzano, of Höchst-on-the-Main, Germany, assignors to Farbwerke, vorm. Meister, Lucius & Brüning. Patent No. 768,455, dated August 23, 1904.

The inventors have found that the product obtained by heating together anthranilic acid and glycollide, and which may be considered as glycollic acid anilide ortho-carboxylic acid, yields when heated with caustic alkalies an indigo leuco body which on being dissolved in water may be oxidized to indigo in the usual manner. Glycollic acid anilide ortho-carboxylic acid consists of colorless crystals of the melting-point 167° C., little soluble in cold, abundantly soluble in hot water, easily soluble in alcohol, ether, and acetone.

AZO DYE AND PROCESS OF MAKING SAME.

Paul Julius, Hans Reindel, and Fritz Carl Günther, of Ludwigshafen-on-the-Rhine, Germany, assignors to Badische Anilin und Soda Fabrik. Patent No. 770,177, dated September 13, 1904.

Ortho-hydroxy azo coloring-matters can be obtained from disulphonated or polysulphonated amins which possess a sulpho group in the ortho position to the amido group. The usual method of

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effecting the substitution of the sulpho group by the hydroxyl group has been by diazotizing the said amin sulpho-acids and treating the diazo compounds with substances which have the power of fixing mineral acids, such as carbonates, bicarbonates, or acetates of the alkalies or of the alkaline earths.

The inventors now claim that if the substitution takes place in the presence of chlorine or of a hypochlorite, or if after the substitution has taken place chlorine or a hypochlorite be added to the reaction mixture the sulphurous acid or the salt of sulphurous acid is oxidized to sulphuric acid or a salt thereof, and in consequence the subsequent yield of hydroxy azo coloring-matter is greatly increased. By this process new ortho-hydroxy coloring-matters are obtained by treating a diazotized aromatic alpha-naphthylamine sulpho-acid (which contains a sulpho group in the ortho position to the diazo group) as described above and then combining the ortho-hydroxy-diazo compound with beta-naphthol. These new coloring-matters dye unmordanted wool dark-reddish violet shades, and these shades on treatment with a bichromate become blue black.

The claim specifies the product from 1.2.4 naphthylamine-disulpho acid.

PRINTING COMPOUND OF ORTHONITROPHENYL LACTOKETONE.

Sylvain Eichhart, of St. Fons, near Lyons, France, assignor to Société Chimique des Usines du Rhône. Patent No. 772,560, dated October 18, 1904.

This invention relates to novel preparations or compositions of o-nitro-phenyl-lacto-ketone suitable for dyeing and printing. These preparations can be readily transformed into indigo by the action of alkalies.

It has already been proposed to employ o-nitro-phenyl-lacto-ketone in the printing of textile materials with indigo colors; but

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up to the present, owing to the insolubility of the product, it has not been possible to employ this ketone in a direct manner. Technical results have only hitherto been obtained with this ketone by using its bisulphite compound, which is soluble in water.

It is now discovered that soluble organic sulphonie and carboxylic acids and the soluble salts or organic sulphonie and carboxylic acids render nitro-phenyl-lacto-ketone easily soluble in water, and that the mixture of these products with the ketone require simply to be dissolved in water to be ready for use. For the purposes of this invention the acids mentioned are the equivalents of the salts, being, in effect, salts of hydrogen. Of the fatty-acid series there may be employed, for instance, acetic acid, lactic acid, sulphonated oleic acid, their soluble mineral salts and esters, Turkey-red oil (the ammonia salt of ricinoleic sulphonie acid), and similar bodies. Of the aromatic series the sulphonie acids of benzene, toluene, naphthalene, and naphthol and their soluble salts, as well as the salts of benzoic acid, salicylic acid, and the like, have been found suitable.

PROCESS OF MAKING INDOXYLIC COMPOUNDS.

Wilhelm Behaghel and Gustav Curt Schumann, of Ludwigs-hafen-on-the-Rhine, Germany, assignors to Badische Anilin und Soda Fabrik. Patent No. 772,775, dated October 18, 1904.

The inventors have discovered that indoxyl or a derivative thereof is obtained when hydroxy-ethyl-aniline ($C_6H_5.NH.CH_2-CH_2OH$) or an analogue or a derivative thereof (such as its carboxy derivatives or those which contain an alkyl group attached to the nitrogen atom) is heated with a caustic alkali or with a mixture of caustic alkalies with or without the addition of a water-removing agent, such as an alkaline oxide, or alkaline earth, or alkaline amide, or alkali metal. Instead of the free hydroxy-ethyl bases their alkali salts may be employed. The indoxyl or derivative thereof so obtained can be transformed in the usual

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manner or in any suitable manner into the corresponding indigo coloring-matter.

PROCESS OF MAKING LAKES FROM SULPHUR DYES.

Richard Gley, of Berlin, Germany, assignor to Actien Gesellschaft für Anilin Fabrikation. Patent No. 772,931, dated October 25, 1904.

In United States Letters Patent No. 714,687 a process for the production of lakes from sulphur dyes is described.

The present inventor now claims that this process cannot be applied with practical success to such sulphur dyes which in the presence of alkali sulphides are readily reduced, forming either almost colorless leuco compounds or such reduction products which possess another and very much weaker coloration than corresponds to the shades which are obtainable when cotton is dyed from these solutions. If to these solutions the salt of an earth-alkali metal is added, the precipitate obtained has only a slight and dull coloration and consists almost entirely of the metal salt of the leuco compound or of the reduction product of the respective dye. Besides, this precipitation is no complete one, a great part of the leuco compound remaining in solution.

A new and very simple process which allows the production of bright-colored lakes from all these aforementioned sulphur dyes. This new process consists in adding to the aqueous solution of the sulphur dyes in alkali sulphide the solution of a salt of an earth metal or alkaline-earth metal and precipitating the lake by means of an oxidizing agent in the heat. The simplest oxidizing medium is a current of atmospheric air, which is blown through the solution; but hydrogen peroxide, hydrochloride, or the like will produce a similar effect, only taking care to avoid an excess of the oxidizing substance. A suitable lake base, such as aluminium hydroxide, etc., may be added to the solution before, during, or after the oxidation process.

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YELLOW SULPHUR DYE AND PROCESS OF MAKING SAME.

Albrecht Schmidt and Otto Rhodius, of Höchst-on-the-Main, Germany, assignors to Farbwerke, vorm. Meister, Lucius & Brüning. Patent No. 773,346, dated October 25, 1904.

The inventors have found that yellow dyestuffs of great purity and fastness may be obtained if the products of reaction of carbon bisulphide on metatoluylenediamine are heated with sulphur at, for instance, 190° to 220° C. in presence of aromatic amines, such as benzidine or similarly acting bases, and the products thus obtained are dissolved in alkali sulphides.

The product from benzidine dyes cotton a beautiful pure yellow of great fastness. It is readily soluble in water and alcohol, and the free acid of the dyestuff is easily obtained by means of the usual precipitants. By modifying the temperature and time when sulphurizing the shade assumes a more or less red tint.

GREEN ANTHRACENE DYE.

Max Kugel, of Wiesdorf, near Cologne, Germany, assignor to Farbenfabriken of Elberfeld Co., of New York, N. Y. Patent No. 775,367, dated November 22, 1904.

This patent relates to the manufacture of a new dyestuff, being a hydroazine derivative of the anthracene series.

The new coloring matter can be obtained by heating the 1-4-diamido-2-3-dibromoanthraquinone with eupric chloride in the presence of a suitable dissolving or diluting agent, and preferably with the addition of a product having a weak alkaline reaction, such as sodium acetate or the like.

The new coloring-matter thus obtained represents bluish-black needles, insoluble in alcohol and soluble in concentrated sulphuric acid with a green color. Upon treatment with hydrosulphite and caustic-soda lye it is transformed into a hydro compound, the alkaline solution of which has the properties of a "vat" suitable for dyeing and printing. This vat dyes unmordanted cotton blue

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shades, which turn to fast green on exposing the dyed goods to the air or on washing them with water.

BLUE ANTHRACENE DYE.

Max Kugel, of Wiesdorf, near Cologne, Germany, assignor to Farbenfabriken of Elberfeld Co., of New York, N. Y. Patent No. 775,368, dated November 22, 1904.

The inventor describes a new dyestuff, being a hydroazine derivative of the anthracene series. The process for producing this coloring-matter consists in heating the 1-methylamido-2-bromo-anthraquinone with cupric chloride in the presence of a suitable dissolving or diluting agent, and preferably with the addition of a product having a weak alkaline reaction, such as sodium acetate or the like.

The new coloring-matter thus obtained represents blue microscopic needles having a metallic lustre. It is soluble in hot nitrobenzine, aniline, and quinoline with a greenish-blue color, and soluble in concentrated sulphuric acid with a yellowish-brown color. Upon treatment with hydrosulphite and caustic-soda lye it is transformed into its hydro compound, the alkaline solution of which has the properties of a "vat" suitable for dyeing and printing unmordanted cotton, pure blue fast shades being thus obtained.

GREEN-BLUE ANTHRAQUINONE DYE.

Max Kugel, of Wiesdorf, near Cologne, Germany, assignor to Farbenfabriken of Elberfeld Co. Patent No. 775,369, dated November 22, 1904.

This patent describes a new dyestuff, being a hydroazin derivative of the anthracene series. The process for producing this coloring-matter consists in heating the 1-3-dibromo-2-amidoanthraquinone with cupric chloride in the presence of a suitable dissolving or diluting agent and preferably with the addition of

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a product having a weak alkaline reaction, such as sodium acetate or the like.

The new coloring-matter thus obtained is a homogeneous product consisting of blue needles. It is soluble in hot nitrobenzene and aniline with a greenish-blue color and soluble in concentrated sulphuric acid with an olive-brown color. Upon treatment with hydrosulphite and caustic-soda lye it is transformed into its hydro compound, the alkaline solution of which has the properties of a "vat" suitable for dyeing and printing unmordanted cotton, pure greenish-blue fast shades being thus obtained.

DARK-BLUE SULPHUR DYE.

August Leopold Laska, of Offenbach-on-the-Main, Germany, assignor to the firm of K. Oehler. Patent No. 775,570, dated November 22, 1904.

This patent describes the process for obtaining, and as a new product, the dyestuff which is obtained from melting together with alkali polysulphides at a temperature of about 100° to 125° C., the dinitro-phenyl-chloro-oxytolylamin, resulting from condensing dinitro-chloro benzene ($\text{Cl}:\text{NO}_2:\text{NO}_2 = 1:2:4$) with para-amido-ortho-chloro-ortho cresol ($\text{OH}:\text{CH}_3:\text{NH}_2:\text{Cl} = 1:2:4:6$) which yields on cotton when dyed in a bath containing sodium sulphide, dark-blue shades.

BLUE SULPHUR DYE AND PROCESS OF MAKING SAME.

Albrecht Schmidt and Fritz Bethmann, of Höchst-on-the-Main, Germany, assignors to Farbwerke, vorm. Meister, Lucius & Brüning. Patent No. 776,264, dated November 29, 1904.

The inventors have found that by heating dialkyl-para-amido-para'-oxy-meta'-chlordiphenyl-amines with sulphur and alkali sulphides in the proportion of more than one part, by weight, of

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sulphur to four parts of sulphide of an alkali metal (French Patent No. 303,524), preferably in presence of a solvent at a temperature of below 100° C., they are transformed into clear blue sulphurized dyestuffs of greater intensity and more valuable properties than the dyestuffs obtained by said French patent. These dyestuffs have proved to be free from chlorine. The parent materials may be obtained, for instance, by oxidizing diethyl-para-phenylendiamine with ortho-chlorophenol and reducing the chlorinated indophenol thus obtained.

The dyestuffs dye unmordanted cotton blue in an alkaline sulphide bath.

PROCESS OF MAKING INDOXYL, ETC.

Augustus Bischler, of Basle, Switzerland, assignor to the firm of Basle Chemical Works. Patent No. 776,884, dated December 6, 1904.

The improvements relate to the process for manufacture of indoxyl, its homologues, and their derivatives by melting phenylglycine salts with alkalis in the presence of alkali metals.

By these improvements excellent yields of indoxyl, its homologues, and their derivatives are obtained by adding to the mixtures of phenylglycin, its homologues, or their derivatives, with alkalis and alkali metals or by passing through the mixtures in the form of gas or vapor a substance which has the property of forming with the alkali metal a compound capable of eliminating or separating water from the mass. Among such substances are, for instance, acetylene, ammonia, or substituted ammonia, such as aniline, diphenylamine, or the like.

The process consists in heating for some time until the greater part of the alkali metal has reacted the mixture of phenylglycine salt with the alkali and alkali metal to the temperature necessary for the formation of indoxyl, then adding the substance or substances of the kind in question and continuing to heat.

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GREEN SULPHUR DYE AND PROCESS OF MAKING SAME.

Melchior Böniger, of Basle, Switzerland, assignor to Chemical Works formerly Sandoz, of Basle, Switzerland. Patent No. 776,885, dated December 6, 1904.

In the U. S. Patent No. 675,585 are described dark-blue sulphur dyes derived from paraoxyphenyl 1-4 nitronaphthylamine sulphonic acids. The same starting materials at higher temperatures yield more green-black coloring-matters. The formation of these green-black coloring-matters, even at moderate heat, can never be entirely avoided, and they are in this way objectionable by-products in the manufacture of blue dyes. Similar observations have been made in using the paraoxyphenyl 1-4 naphthylenediamine sulphonic acids. In order to avoid further condensation in the free amido group of the aforesaid starting materials, this was substituted with an aryl group, and it was discovered that the aryl 1-paraoxyaryl-4 naphthylenediamine sulphonic acids yield green sulphur colors instead of the expected blue colors. If the melt with alkali polysulphides is made in presence of copper or copper salts, even bright yellowish-green sulphur dyes possessing extraordinary fastness to light and washing are obtained. The 1-4 naphthylenediamine sulphonic acids, which are especially suitable for this process, are the leuco derivatives of indophenols, which can be readily obtained by simultaneous oxidation of phenyl- or tolyl-1 naphthylamine 5-, 6-, 7-, or 8-monosulphonic acids and p-amido phenol or chloro-p-amidophenol in molecular proportions. Naturally the indophenol bodies themselves can also be directly employed, being reduced by the polysulphide in the process to the corresponding leuco derivatives.

BLUE DYE AND PROCESS OF MAKING SAME.

Julius Abel, of Mannheim, and Arthur Lüttringhaus, of Ludwigshafen-on-the-Rhine, Germany, assignors to the Badische Ani-

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lin und Soda Fabrik. Patent No. 777,323, dated December 13, 1904.

This invention relates to the production of substantive blue coloring-matters containing sulphur, which directly dye cotton from a bath containing sodium sulphide.

Methylene-violet or an analogue thereof is suitably treated with sulphur chloride—for instance, that represented by the formula S_2Cl_2 . A coloring-matter results which directly dyes cotton blue or blue-violet shades from a bath containing sodium sulphide. If this blue-violet coloring-matter is further treated with sulphur and alkali sulphide, a coloring-matter is obtained which directly dyes cotton from a bath containing sodium sulphide shades of blue which are less red than those aforementioned.

ANTHRAQUINONE DYE AND PROCESS OF MAKING SAME.

Eduard Hepp, of Frankfort-on-the-Main, and Rudolf Uhlenhuth, of Höchst-on-the-Main, Germany, assignors to Farbwerke, vorm. Meister, Lucius & Brüning. Patent No. 778,036, dated December 20, 1904.

This invention relates to the production of new green dyestuffs by acting with sulphonating agents on 1.4-dialphylido-5-oxy-anthraquinones.

The said dialphylido-oxy-anthraquinones may be prepared by condensing 1.4.5-trioxy-anthraquinone hydride with aromatic amines in presence of the oxygen of the air, the trioxy-anthraquinone hydride being obtained, for instance, as follows: The 1.5 and 1.8-nitroanthraquinone-sulphonic acids are transformed into the corresponding methoxyanthraquinone-sulphonic acids by means of a solution of caustic alkalies in methyl alcohol. These methoxyanthraquinone-sulphonic acids are then converted into the 1.4.5-trioxy-anthraquinone by nitrating them, reducing the products thus obtained, and heating under pressure the corresponding amido-oxy-anthraquinone-sulphonic acids in a closed vessel with

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hydrate of lime. By heating the trioxy-anthraquinone with stannous chloride and crystallizing the product from benzine the trioxy-anthraquinone hydride is obtained in the shape of orange-red prisms soluble in concentrated sulphuric acid with a yellow color and melting at 210° C. It is soluble in dilute caustic alkalies with a yellow color which becomes violet by the oxygen of the air.

The new dyestuff sulphonic acids represent when dry and pulverized dark-green powders very easily soluble in water, the aqueous solution remaining unchanged on adding sodium carbonate, but turning somewhat more bluish on adding caustic alkali. They dye unmordanted and chrome-mordanted wool and chrome-mordanted cotton green shades very fast to light acids and alkalies.

COMPOUND DYE.

Leopold Heinrich Delhoff, of Mannheim, and Gustav Wessbecher, of Ludwigshafen-on-the-Rhine, Germany, assignors to Badische Anilin und Soda Fabrik. Patent No. 778,175, dated December 20, 1904.

The claims cover:

1. The new solid composition of matter consisting of an ortho-hydroxy-azo-beta-naphthol coloring-matter and a sulpho-acid of a rosaniline derivative, all substantially as hereinbefore described.

2. The new solid composition of matter consisting of Palatine chrome-black and a sulpho-acid of a rosaniline derivative.

3. The new solid composition of matter consisting of Palatine chrome-black, a sulpho-acid of a rosaniline derivative and a solid diluent.

4. The new solid composition of matter consisting of Palatine chrome-black a sulpho-acid of a rosaniline derivative and Glauber salt.

5. The new solid composition of matter consisting of Palatine chrome-black and alkali violet 4BN.

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6. The new solid composition of matter consisting of Palatine chrome-black alkali violet 4BN and a solid diluent.

7. The new solid composition of matter consisting of Palatine chrome-black, alkali violet 4BN and Glauber salt.

BETA-NAPHTHOL AZO DYE AND PROCESS OF MAKING SAME.

Karl Elbel, of Biebrich, Germany, assignor to the firm of Kalle & Company. Patent No. 778,476, dated December 27, 1904.

This invention relates to the manufacture of new beta-naphthol-azo colors, which are obtained by acting on beta-naphthol with the diazo derivatives of 1.2 amidonaphtholmono or disulpho acids. In order to obtain these coloring-matters in a pure state and in a good yield, it is necessary to employ very concentrated diazo- and beta-naphthol solutions. In dilute solutions or in solutions of a concentration as commonly employed in azo-color manufacture a combination does not take place. It is further necessary to employ an excess of alkali.

The new products dye wool in an acid-bath bluish-red to violet shades, which are converted by a subsequent treatment with a bichromate into violet to bluish-black shades, which meet the highest requirements as regards fastness in all respects.

BLUE SULPHUR DYE AND PROCESS OF MAKING SAME.

Karl Elbel, of Biebrich, Germany, assignor to the firm of Kalle & Company. Patent No. 778,478, dated December 27, 1904.

In U. S. Patent No. 778,477 is described the mode of preparing a new monochloro-alpha-naphthol. It is found that this monochloro-alpha-naphthol yields indophenols when oxidized in presence of a molecular proportion of a para diamine of the benzene series or of an unsymmetrical alkyl derivative of the same. These

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indophenols or the phenylnaphthylamine derivatives obtained by reducing the same yield valuable violet to greenish-blue sulphur colors dyeing unmordanted cotton when heated with alkali polysulphides.

The claims specify the dyestuff obtained from monochloro- α -naphthol and dimethyl-paraphenylenediamine, which is a dark-blue powder insoluble in water, soluble in alcohol with blue color, easily soluble in water in presence of sodium sulphide and dyeing unmordanted cotton from such a solution fast greenish-indigo shades.

BLACK DISAZO DYE AND PROCESS OF MAKING SAME.

Karl Schirmacher, of Höchst-on-the-Main, Germany, assignor to Farbwerke, vorm. Meister, Lucius & Brüning. Patent No. 778,610, dated December 27, 1904.

A meta-phenylenediamindisulphonic acid is described in the German Letters Patent No. 78,834. There it is said that it may be diazotized and tetrazotized; but it is not mentioned in which manner. The inventor has found that only under certain conditions said meta-phenylenediamindisulphonic acid can be tetrazotized without simultaneously producing a vesuvian coloring-matter, and the resulting product is not, as might be expected, the tetrazobenzoldisulphonic acid corresponding to the phenylenediamindisulphonic acid, but a new tetrazophenosulphonic acid. In order to avoid the formation of the vesuvian dyestuff and in order to get a good yield of the tetrazophenosulphonic acid, a larger quantity of nitrite is used than is required for normal tetrazotizing.

By the combination of the new tetrazophenosulphonic acid with beta-naphthol a disazo dye is produced which dyes wool a red-brown shade. The latter is converted into a fast black by a subsequent treatment with chromates.

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ORTHO-DIOXYANTHRAQUINONE-SULPHO ACID AND PROCESS OF MAKING SAME.

Michael Iljinsky, of Krefeld, Germany. Patent No. 778,670, dated December 27, 1904.

This patent describes the process of converting the ortho-anthraquinone sulphonie acids into the corresponding oxy derivatives, said process consisting in heating under pressure in the presence of water the alkali salts of the ortho-anthraquinone sulphonie acids with compounds of the alkaline earths, with the addition of oxidizing means.

Also as a new compound an ortho-dioxy-anthraquinone-mono-sulpho acid dyeing mordanted wool well violet-red, and forming easily soluble alkali salts and difficultly soluble earth-alkali salts from which the barium salt $C_{14}H_{10}O_2S_2Ba$ forms orange-colored needles difficultly soluble in cold water.

VIOLET SULPHUR DYE AND PROCESS OF MAKING SAME.

Albrecht Schmidt, of Höchst-on-the-Main, Germany, assignor to Farbwerke, vorm. Meister, Lucius & Brüning. Patent No. 778,713, dated December 27, 1904.

If phenosafraninon (obtained, for instance, by decomposing phenosafranin) be heated with sulphur to a high temperature ($190^{\circ} C.$), a vivid evolution of hydrogen sulphide occurs. The product thus obtained is soluble in alkali sulphides and in this solution dyes cotton powerful violet shades of good fastness. The result is remarkable in many respects, as, for instance, safranin, corresponding with safraninone, yields when heated with sulphur alone no sulphurized dyestuff.

The violet shades, treated with copper, become bluer and their fastness increased. When oxidized on the fibre,—for instance, by means of steaming, hydrogen peroxide, etc.,—the dyeings become of a more vivid hue.

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ACYLATED INDOXYL AND PROCESS OF MAKING SAME.

Daniel Vorländer and Bruno Drescher, of Halle-on-the-Saale, and Paul Seidel of Ludwigshafen-on-the-Rhine, Germany, assignors to Badische Anilin und Soda Fabrik. Patent No. 778,725, dated December 27, 1904.

The inventors have discovered that valuable monoacylated compounds of indoxylie acid and indoxyl can be obtained by causing a moderate reaction to take place between indoxyl and indoxylie acid or salts thereof and, on the other hand, acetic anhydride, acetyl chloride, benzoyl chloride, or similar acid derivatives, all of which are hereinafter included in the expression "organic-acid derivative." As indoxylie acid readily changes into indoxyl, emitting carbonic-acid gas, it usually happens that upon acylating indoxylie acid the acyl derivatives of indoxylie acid and indoxyl are obtained in one operation. According to the nature of the initial material used and from the method of working, the acyl compounds of indoxylie acid or of indoxyl can be obtained as the principal or sole product. What is claimed in this application are the hereinbefore-defined acyl derivatives of indoxyl and the process of producing same.

PROCESS OF MAKING INDIGO.

Rudolf Knietsch, Paul Siedel, and Otto J. Gaul, of Ludwigshafen-on-the-Rhine, Germany, assignors to the Badische Anilin und Soda Fabrik. Patent No. 778,752, dated December 27, 1904.

In the specifications of Patents No. 619,883 and No. 622,139, there is described the synthesis of indigo by treating phenyl-glycocol or analogues thereof, their salts, ethers, and anhydrides with a body that effects the extraction of water and oxidizing the leuco compound obtained.

The method of obtaining artificial indigo in its unsulphonated form consisted in treating the phenyl-glycocol body in a caustic-alkali melt. Caustic potash or caustic soda or a mixture of these

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two alkalies with one another were recommended for use, and it is further stated in the specification of Patent No. 617,652 that quicklime may also be added to the alkali with good results. The present invention is, however, based upon the peculiar behavior of caustic potash containing little or no water, together with the specific action of an oxide or oxides of the alkali earths, for if a sufficient quantity of a dry oxide of an alkali-earth metal be added to the caustic-alkali melt containing water-free caustic potash or caustic soda that is nearly free from water the yield of indigo is so much increased that the commercial manufacture of indigo is rendered possible by this process. Thus if an alkali melt be taken composed of 3600 parts of caustic potash and caustic soda in molecular proportions containing only about $2\frac{1}{2}$ per cent. of water and 1000 parts of quicklime and in this melt 500 parts of dry potassium salt of phenyl-glycocoll be added at a temperature of 265° C., a yield of about fifty per cent. of indigo is obtained. Such a mixture of caustic alkalies with this freedom from water can be obtained, for instance, by adding to the mixture of the ordinary commercial caustic potash and caustic soda the requisite quantity of sodium oxide. A similar mixture of the bodies obtained in any other way can of course be used; but it is desirable that no superoxide be present. If the mixture above stated be improved still further by reducing the quantity of water in it, the yield of indigo is still further increased. Further, the yields of indigo can be increased if more quicklime be added to the mixture; but the addition of a greater proportion of quicklime than that above stated is liable to cause difficulties in stirring the melt.



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II.—PROCESSES OF APPLICATION.

PROCESS OF DYEING WOOD.

Joachim Brenner, of Gainfarn, Austria-Hungary. Patent No. 755,993, dated March 29, 1904.

In carrying out this process in a practical manner first super-heated steam is forced in the ordinary way into the wood, which may be in the log or cut up and which it is desired to dye, for the purpose of opening the wood fibres and loosening the incrusting and resinous substances which envelop the bundles of fibres and which interfere considerably with the affinity of cellulose for coloring-matters. After this steaming, sulphuric acid of 10° to 20° Bé. is forced into the wood, whereby the incrusting and resinous substances which have been loosened by the steaming are entirely destroyed and the cellulose fibres which have been laid bare are parchmented—that is to say, the surface of the fibres is so altered that they will now take readily the coloring-matter subsequently applied to them. After the cellulose fibres have been thus parchmented the sulphuric acid contained in the wood is neutralized, preferably by introducing into the wood a suitable dilute solution of any alkali. The salt produced may be removed by washing or soaking in water. The treated wood is now dyed in the usual manner—that is to say, by forcing into the wood at a part cut across the grain a solution of the desired coloring-matter mixed with suitable mordanting agents, according to the composition of the coloring-matter employed—such as Glauber salt, iron vitriol, acetic acid, chloride of zinc, copper vitriol, tartar emetic, or cuprammonia in the proportion of five to fifteen per cent. of the solution employed.

PROCESS OF RENDERING LEATHER DURABLE AND WATERPROOF.

Friederich Stoffer, of Hamburg, Germany. Patent No. 757,361, dated April 12, 1904.

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The inventor has found that a fat-free solution of india-rubber in benzol applied to the under side of the leather penetrates much deeper into the pores and impregnates the leather much better in view of the fact that the structure of the flesh side is so much more porous than the structure of the upper side. Another advantage of applying the india-rubber solution free of fat to the inner side of the leather is to be found in the fact that the lining generally used for shoes completely covers and protects the rubber coating, so that it cannot be so readily removed by mechanical influences. The india-rubber solution makes the leather more durable and flexible, which is of great importance in using soft and poor leather; but such leather impregnated on its under side by an india-rubber solution is objectionable, inasmuch as it is not smooth enough, and consequently it shows a tendency to crease and to wrinkle. To prevent this, the under surface is submitted to another important step by this process, which consists in well rubbing the leather with powdered talc as soon as the solution of india-rubber has become dry, the talc forming a mechanical combination with the layer of india-rubber and presenting a smooth surface and a durable waterproof leather. The leather thus prepared can absorb moisture on its upper surface; but the same cannot penetrate the leather towards the foot, and as its evaporation is apt to abstract heat from the foot it is desirable to grease the upper surface of the shoe in the usual manner, thus excluding the moisture as much as possible.

PROCESS OF DISCHARGING HALOGEN INDIGOES.

Armand Julius Stiegelmann and Karl Reinking, of Ludwigs-hafen-on-the-Rhine, Germany, assignors to Badische Anilin und Soda Fabrik. Patent No. 760,817, dated May 24, 1904.

It is well known that although ordinary indigo can be discharged by the use of the usual oxidizing agents (such as chromates, chlorates, and bromates), yet these agents of themselves have not the power of completely discharging halogenated indigo.

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The inventors now claim, however, that halogenated indigo can be discharged to a sufficient degree by employing an oxygen-carrier mixed with the oxidizing agent. Suitable oxygen-carriers for the purpose are, for example, soluble compounds of bismuth, antimony, magnesium, mercury, cobalt, arsenic, and arsenic acid, and also salts of vanadic acid, nitric acid, arsenious acid, arsenic acid, and ferricyanic acid. It is a characteristic of the action of these compounds that a very small quantity thereof is sufficient to produce the desired effect and that any excess beyond the necessary quantity does not increase the discharging power.

PROCESS OF OILING AND FINISHING TEXTILE MATERIALS.

Robert Stewart Carmichael, James Carmichael, and Frederic Robert Carmichael, of Paris, France. Patent No. 761,203, dated May 31, 1904.

This process has for its object, first, to effect the oiling, finishing (sizing), and loading by the use of a single bath having a casein base, the operation being carried out either by steeping or by means of a mechanical oiler; secondly, to finish (size) and load the tissues, yarn, or raw textiles in a durable manner by the use of casein as the means for fixing the loading or inert substances.

It is based on the colloidal property of casein, its plasticity, and the faculty it possesses of forming with mineral oils soapy solutions which are caseinic and capable of being mixed with one another and also of holding in suspension a very large proportion of inert or heavy substances.

The proportion of the substances composing the bath employed for the carrying out of our process may vary according to the nature of the materials to be treated. Thus in the case of raw textiles the proportion of mineral oil or fatty material added is about six times as much as that of the casein, while when

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treating spun or woven textiles the fatty material added is much weaker than that of the casein—say about six times less than the latter.

PROCESS OF TREATING PICKLED OR TANNED SKINS OR HIDES.

Otto P. Amend, of New York, N. Y. Patent No. 768,259, dated August 23, 1904.

The object of this invention is to reduce the contraction in pickled and tanned skins, which is due to the astringent effect of the acids contained in such skins, and to produce a slight oxidizing effect upon them, and such object is effected neutralizing the acids contained in such skins by immersing the skins in a slightly alkaline or neutral solution of a nitrite of an alkali or of an alkaline earth.

A suitable method, for instance, is to prepare a solution consisting of ten ounces of nitrite of soda (NaNO_2) in seventy gallons of water, so as to make a slightly alkaline or neutral solution. This solution will oxidize and deacidify one dozen pickled Australian sheep-skins. "Pickled skins" are skins which have been subjected to the action of a pickle, but which have not yet been tanned. Various pickles are employed for this purpose in which either sulphuric, hydrochloric, lactic, or acetic acids are used in conjunction with common salt, sodium chloride (NaCl); but the usual pickle consists of sulphuric acid and sodium chloride. This invention is effective with skins pickled in any of these. The quantity of the solution should be regulated, of course, according to the number of skins to be treated. For mineral-tanned skins which contain either sulphuric or hydrochloric acid—in the case of the two-bath chrome process they contain sulphuric acid, hyposulphurous acid (H_2SO_2), and thio sulphuric acid ($\text{H}_2\text{S}_2\text{O}_3$)—on the other hand, a solution, for instance, of five ounces of nitrite of soda (NaNO_2) in seventy gallons of water is used. This solution is also slightly alkaline

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or neutral and will deacidify and oxidize one dozen of tanned calf-skins. Upon all these acids at ordinary temperatures the action of the sodium nitrite (NaNO_2) is similar, and it also exerts an oxidizing effect on any free sulphur that is present. The quantity of the solution to be used is regulated by the number of tanned skins to be treated.

OXIDIZING SULPHUR DYE.

Henry James Cooke, of New York, N. Y., assignor of one-half to A. Klipstein & Co. Patent No. 769,059, dated August 30, 1904.

This invention relates to the oxidation of the fibre of the so-called "sulphur dyes" in order to develop some property of color, fastness, or the like which is not possessed to the same extent by the unoxidized colors. The dyestuff known as "pyrogen blue" may be taken as an example of these sulphur dyes; but the treatment of others is also included in the invention.

Sulphur dyes have been oxidized on the fibre by the action of such oxidants as the bichromates and peroxides, and it has also been proposed to subject the dyed fibre to a mixture of atmospheric air and steam in the presence of alkali at a temperature above the boiling-point of water in order to oxidize the sulphur dye thereon.

With the present invention the sulphur dye is oxidized in the presence of the fibre by means of ozone produced by the action on air of finely divided essential oil or mixture of oils, such as turpentine, oil of pine, oil of cedar, which are able to convert the oxygen of the air into ozone.

The dyed fibre is charged with such oil and at the same time exposed to air with or without a continuance of the exposure to air after the charging operation is complete; but the dyed fibre may be charged with the finely divided oil without any (or with only inconsiderable) exposure simultaneously of said fibre to air,

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and generally the oxidation of sulphur dyes in this manner is within the scope of the invention.

PRINTING WITH INDANTHRENE.

Paul Jeanmaire, of Mühlhausen, and René Bohn, of Mannheim, Germany, assigns to Badische Anilin und Soda Fabrik. Patent No. 772,237, dated October 11, 1904.

This invention relates to a process of printing indanthrene, the blue coloring-matter which is the subject-matter of U. S. Patent No. 682,523, upon vegetable fibre.

Broadly considered, this invention consists of a printing process in which we cause indanthrene and a caustic alkali to act on each other in the presence of vegetable fibre either in the presence or absence of a suitable reducing agent.

For the purposes of this invention chlor-indanthrene is the equivalent of indanthrene, but brom-indanthrene is not.

In the preferred process a printing-paste containing indanthrene, tin salt, and a thickening agent is printed on the material, then the so-printed material is dried and treated for about one-half minute with a solution of caustic soda containing from thirteen to fourteen and a half per cent. of caustic soda and at a temperature between 65° and 75° C. However, good results can be obtained by employing a printing-paste containing caustic soda, a reducing agent, say tin salt, indanthrene, and a thickening agent, and printing this paste upon the material to be operated upon and steaming it for about five or ten minutes in a Mather-Platt apparatus. It is also found that indanthrene may be printed in the following manner likewise with good results: Pad the vegetable fibre preferably with a solution of grape-sugar and dry it. Now print upon it a paste containing indanthrene, caustic soda, and a thickening agent. Indanthrene may also be printed upon vegetable fibre if there be employed a printing-paste containing indanthrene and caustic soda. This paste may or may not contain a thickening agent. In the latter case some

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inorganic substance, like kaolin, is employed to give consistence to the printing-paste.

PROCESS OF TREATING LEATHER.

Philip Magus, of Collingwood, Victoria, Australia. Patent No. 775,839, dated November 22, 1904.

Many attempts have been made to produce a leather which would be impermeable to moisture, retain its flexibility, acquire resilience, and to a considerable degree be punctureless and be self-healing if punctured, so as to fit such leather particularly for use in pneumatic tires.

The inventor claims that the following process will produce this result.

It consists in first cleaning and drying the leather, immersing it in a bath consisting of benzine, benzol, naphtha and kerosene, then removing and brushing it; again immersing and brushing it, and then hanging it for dripping and evaporation; second, treating the leather successively in baths, each formed of a mixture of Pará rubber, benzine, benzol, naphtha and dissolved isinglass, the baths being varied by increasing the quantity of benzine and naphtha therein, and after each bath, working in the solution by brushing and finally hanging it for dripping and evaporation; third, working into the leather a mixture of benzine, benzol, naphtha, and kerosene, and then allowing the leather to dry.



III.—CHEMICAL PROCESSES.

ART OF MAKING ARTIFICIAL SILK.

Edmund Thiele, of Bamen, Germany. Patent No. 750,502, dated January 26, 1904.

This invention relates to an improvement in the art of making artificial silk; and it consists of an apparatus for effecting the same.

The present apparatus for producing artificial silk is characterized by the formation of the thread being effected in a freely suspended column of liquid—that is to say, a column of liquid which is supported in a vessel only by the pressure of the air, the said vessel being provided with a narrow opening in the bottom. The effect of this novel arrangement is that the precipitation-bath can be under a low pressure, which can be varied, as desired, according as the column of liquid is higher or lower and according to the speed at which the precipitation-bath flows through, the passage of the thread through the opening being thus greatly facilitated by the low pressure.

MANUFACTURE OF WHITE LEAD.

John W. H. James, of Philadelphia, Pa. Patent No. 750,541, dated January 26, 1904.

This invention consists of certain improvements in that method of manufacturing white lead which consists in subjecting oxide of lead simultaneously to the action of acetic acid and carbonic-acid gas, the object being to accelerate the process and obtain a product free from particles of metallic lead and having a pure white color.

In carrying out the process one part of finely ground oxide of lead is mixed with about two and one-half times its weight of water containing nitric or other available acid in quantity suffi-

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cient to attack and convert to the condition of a salt any particles of metallic lead which may be combined with the oxide, care being taken, however, to so select and so limit the quantity of the acid employed that it will not have any injurious effect upon the oxide of lead. The water with which the oxide of lead is mixed is maintained in a state of agitation in the vessel in which the treatment is effected in order to keep the particles of metallic lead in suspension and enable the acid to act effectively upon the same, and during the treatment the mass is heated to a temperature of about 200° F. After reaching this temperature carbonic-acid gas and acetic acid are injected into the mixture, the acetic acid, by preference, not exceeding one-half of one per cent., by weight, of the water, and the carbonic-acid gas being, preferably, at a pressure of about fifteen pounds above that of the atmosphere. The entire mass of oxide having been expanded by the preliminary heating is rapidly acted upon by the acetic acid and carbonic-acid gas, and the conversion into carbonate of lead takes place rapidly and completely.

In order to insure the production of a perfectly white product, there is passed through the magma resulting from the foregoing treatment, oxygen gas under pressure sufficient to insure its free passage, a pressure of about twenty pounds to the square inch having been found to be sufficient for the purpose.

PROCESS OF CONVERTING RAW PEAT INTO PAPER-PULP.

Alfred Beddies, of Berlin, Germany. Patent No. 751,139, dated February 2, 1904.

The object of this invention is to convert in a continuous process raw peat as obtained directly from the bog into a smooth, consistent, and homogeneous pulp suitable for paper-making. By subjecting the raw peat to a continuous series of successive mechanical treatments, it is converted into paper and paper products.

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It is well known that by a simple process of grinding pulp of comparatively uniform consistency may be obtained from wood and pulp and paper made in a continuous operation at the same place of manufacture. This process is not available for peat by reason of its complex and heterogeneous character, whereas wood possesses a comparatively uniform and homogeneous texture. By this process directly from raw peat by mechanical or physical means a uniform pulp or pulp product in a continuous operation is produced.

PROCESS OF PRODUCING HYDRATED SULPHIDE OF ZINC.

Victor Bermont, of Paris, France. Patent No. 751,712, dated February 9, 1904.

The claim covers a process for the preparation of pure zinc salts from the oxygen-bearing compounds, consisting in treating by ammonia the ore previously crushed and in separating by filtration, after decantation, the solution from the solid part; purifying the ammoniacal liquor produced, consisting in precipitating the metals other than zinc in the condition of insoluble sulphides formed when soluble sulphide is gradually added to the first solution, in separating by filtration, after decantation, these precipitates from the liquid mass so as to obtain as precipitable salts only zinc salts, and in precipitating from this solution perfectly pure salts of zinc by the addition of soluble salt giving an insoluble salt of zinc.

METHOD OF MAKING PHOSPHORIC ACID.

Nathaniel B. Powter, of Brooklyn, N. Y.; Edward H. Fallows, executor of said Powter, deceased. Patent No. 751,753, dated February 9, 1904.

This invention relates to the manufacture of phosphoric acid; and it consists in a process of producing phosphoric acid directly

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from aluminic and other phosphates, either pure or as found in nature as phosphate rock.

The objects of the invention are to produce phosphoric acid directly from aluminic and similar phosphates and by a process which is easily carried out, inexpensive, and economical.

In carrying out this process place the aluminic phosphate or other substance from which the phosphoric acid is to be obtained in a retort or series of retorts, connect the same to suitable collecting apparatus and to a suction-pump, and heat the retort to the required degree. This will depend entirely upon the material being treated. With some material fumes will be evolved at a temperature of between 160° and 200° F., while other materials require a greater temperature, ranging all the way from 200° to 1200° F. In practice the retort is heated until the fumes are evolved. During the heating phosphoric acid is given off as a heavy sluggish gas, vapor, or fume, which can be withdrawn from the retort and collected only by applying suction to the retort. The phosphoric acid may be collected by passing it into suitable vessels, in which it is brought into contact with water, the gas being first cooled by preference. The gas begins to come off at a comparatively low heat, and the rapidity with which it comes off is largely dependent upon the amount of suction used.

PROCESS OF MAKING SULPHURIC ANHYDRID.

Emile Raynaud, of Spy, and Léon Pierron, of Jette St. Pierre, Belgium. Patent No. 751,941, dated February 9, 1904.

This invention relates to the manufacture of sulphuric anhydrid without the use of leaden chambers by the means known as the "catalytic" method—that is, by means of substances or bodies acting as vehicles of contact: and the said invention has for its object to provide means for obtaining results in the manufacture of sulphuric anhydrid on a commercial scale as nearly as possible equal to theoretical results.

The process consists, essentially, in promoting at first the com-

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bination of a portion of the sulphurous acid with a portion of the oxygen, and then the combination of the remainder of these two gases, and, lastly, the combination of such portions of the said gases as are liberated by decomposition of the acid formed. For this purpose, substances of uniform richness being used, the temperature must be made to vary, so that the reaction of the gaseous mixture which may have been previously purified with the catalytic substances may take place in a first vessel at a temperature relatively low (say about 300° C.) that will cause the combination of a portion of the sulphurous acid with a portion of the oxygen, and then in a second vessel at a higher temperature (say about 500° C.) sufficient to complete the combination of the remaining portions of the sulphurous acid and even to cause some dissociation of the acid formed, and finally in a third vessel at a temperature (say about 400° C.) sufficient to cause a recombination of the gases that have been dissociated in the second vessel, but not sufficient to bring about a further decomposition.

PROCESS OF FRACTIONING BROMINE APART FROM CHLORINE.

Herbert H. Dow, of Midland, Mich., assignor to the Dow Chemical Company, of Midland, Mich. Patent No. 752,286, dated February 16, 1904.

The claims cover: 1. The steps in the process of fractioning bromine apart from chlorine which consist, in oxidizing bromide-containing brine, in blowing out the purest bromine thus set free by a limited amount of air, then blowing out the remainder of the bromine without further oxidation by a large amount of air, and recovering both portions of bromine thus blown out by suitable absorbents.

2. The steps in the process of fractioning bromine apart from chlorine which consist, in oxidizing bromide-containing brine, in blowing out the purest bromine thus set free by a limited amount

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of air, recovering the same by means of sodium carbonate, blowing out the remainder of the bromine without further oxidation by a large amount of air, and then recovering this bromine by means of absorbing it in a natural brine.

PROCESS OF FRACTIONING BROMINE FROM CHLORINE.

Herbert H. Dow, of Midland, Mich., assignor to the Dow Chemical Company, of Midland, Mich. Patent No. 752,331, dated February 16, 1904.

This improved process is a radical departure in the methods of fractioning apart bromine and chlorine, which are obtained by the oxidation of natural brines, in that heretofore this separation has been accomplished by chemical processes and depended upon the fact that chlorine will liberate bromine from bromides, while in this process the method is purely mechanical and depends upon the fact that the bromine in a brine solution is more volatile than the chlorine formed in the solution at the same time. It is found that when a natural brine is oxidized sufficiently to set free practically all the contained bromine and air is blown through the bromine thus set free the first portions of air escaping from the bromine solution will carry the purest bromine and later portions of air will carry a very impure bromine, the impurity in both cases being chlorine or a volatile compound of chlorine or a combination of the two, some or all of which are produced in quite a large quantity when the brine is oxidized to its complete bromine content.

PROCESS OF MANUFACTURING BROMINE FROM NATURAL BRINES.

Herbert H. Dow, of Midland, Michigan, assignor to the Dow Chemical Company. Patent No. 752,332, dated February 16, 1904.

This invention is a modification of the one described in Patent No. 752,331, for processes of fractioning bromine apart from

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chlorine in that three air systems are used and three grades of bromine are obtained. As there described it is found that when a natural brine is oxidized sufficiently to set free substantially all the contained bromine and air is blown through the bromine thus set free the first portions of air escaping from the bromine solution will carry the purest bromine and that later portions of air will carry a very impure bromine. The impurity in both cases is chlorine or a volatile compound of chlorine or a combination of the two, some or all of which are produced in quite a large quantity when the brine is oxidized to its complete bromine content.

By this improved process the brine is first blown with a relatively small amount of air. This bromine-laden air not only contains a small amount of chlorine relative to the bromine contained in it, but also the percentage of bromine carried away by this air is very high as compared with the percentage of bromine carried away in the corresponding air-passages (U. S. Patent No. 714,160). After having thus recovered the purest bromine there still remains in the brine a large amount of free bromine, which should be removed. This bromine is blown out in separate air systems, and a part recovered in the form of a bromide by a suitable absorbent, and the remainder by means of natural brines, which, as explained in Patent No. 714,160, contain impurities capable of absorbing the bromine.

PROCESS OF MAKING SULPHURIC ACID.

Herman Hegeler and Nicholas Heinz, of Lasalle, Ill. Patent No. 752,677, dated February 23, 1904.

The invention is an improvement upon what is generally known as the "Glover tower" process, which is carried out in an apparatus consisting of a Glover tower, leaden chambers, and Gay-Lussac tower, connected in a flue-like system and attached to a sulphur-burner.

The object of this improvement is to make the whole of the Glover tower a sulphuric-acid-making part of the apparatus, to

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make the strongest sulphuric acid free from nitrogen compounds therein without increasing the strain on the apparatus and without increasing the nitre consumption, and at the same time correspondingly reduce the required amount of chamber-space. To this end we propose to have a large proportion of nitrogen compounds to sulphurous compounds present throughout the full height of the Glover tower to avoid excessive temperatures at the bottom of the tower, to produce a more uniform temperature throughout the tower, to secure better mixing of the nitrogen compounds and the sulphurous compounds and greater activity thereof, and to have the molecule of nitrogen compound do service many times before passing on to the chambers and to the Gay-Lussac tower.

PROCESS OF MAKING ORGANIC ACID.

Nicholas Zelinsky, of Moscow, Russia. Patent No. 752,744, dated February 23, 1904.

From published papers it is known that the bromo and iodo substituted products of the synthetic cyclic hydrocarbons when in presence of ether easily react with magnesium and yield metallo-organic compositions of the general formula: $C_nH_{2-i}MgBr(T) +$ ether. These latter reacting on carbonic acid and setting or binding it are converted into complex combinations or compounds having the formula $C_nH_{2-i}COOMgBr(T) +$ ether, which complex combinations when being decomposed by aqueous solutions of metallic acids yield the corresponding organic fatty acids. Bromine and iodine, and especially the synthetic hydrocarbons, however, present so dear and valuable an initial product that it proves impossible to employ them for technical purposes with the view of obtaining the terminal products of reaction—i.e., fatty acids—as the technical production ought to be as cheap as possible.

The object of this invention consists in a process by which the bromine and iodine are allowed to be replaced by the cheaper chlorine and the hydrocarbons of synthetic nature by fractions of

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natural petroleum or earth-oil, which, as it is known, presents a mixture of cyclic and open-chain hydrocarbons.

PROCESS OF MAKING ORGANIC ACID COMPOUNDS.

Wilhelm Bäuml, of Ludwigshafen-on-the-Rhine, Germany, assignor to Badische Anilin und Soda Fabrik. Patent No. 752,947, dated February 23, 1904.

This invention relates to the manufacture of organic acid compounds by the use of a salt of chlorsulphonic acid.

Experiments hitherto made by other investigators in the treatment of organic acids or their salts with free chlorsulphonic acid have led to no result or have yielded exceedingly small quantities of acid chloride, so that no commercial process for the manufacture of organic-acid compounds can be based upon any such treatment.

The inventor has discovered that by treating a salt of an organic acid with a salt of chlorsulphonic acid the organic acid chloride is formed, and as it is well known that the acid chlorides react with the salts of organic acids to yield the acid anhydrides by suitably arranging the proportion of the salt of chlorsulphonic acid to the salt of the organic acid employed, the formation of an acid anhydride can be effected smoothly and with a good yield in one operation.

If desired, the free organic acid can be employed instead of a salt thereof.

PROCESS OF MAKING CHLOROFORM.

Albert W. Smith, of Cleveland, Ohio. Patent No. 753,325, dated March 1, 1904.

This improved process relates to the manufacture of chloroform, its object being to produce the same in a manner more economical than those of the processes of production generally used at present, and at the same time to produce a product purer

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than that produced by the present commercial process from acetone and chloride of lime, in that it contains no dangerous and poisonous oxygen compounds, from which the latter must be carefully freed.

The process consists in the production of chloroform by the following steps, including the action of heated sulphur upon heated carbon, so as to produce carbon bisulphide, the action of chlorine upon sulphur, so as to produce sulphur chloride or dichloride, the action of sulphur chloride or dichloride upon carbon bisulphide, so as to produce carbon tetrachloride, and, finally, the reduction of the carbon tetrachloride, so as to produce chloroform.

PROCESS OF MAKING CONDENSATION PRODUCTS FROM DICARBO ACIDS AND BROMATED PHTHALIC ACIDS WITH NAPHTHOLS.

Anatole Denguine and Samuel Levinsohn, Geneva, Switzerland. Patent No. 753,372, dated March 1, 1904.

The claims cover:

1. The process of producing condensation products from dicarboacids and bromated phthalic acids with naphthols, which consists in melting dicarboacids and bromated phthalic acids with naphthols in presence of boric acid, and then directly isolating the corresponding acids.

2. The process of producing condensation products from dicarboacids and bromated phthalic acids with naphthols, which consists in melting dicarboacids and bromated phthalic acids with naphthols in presence of boric acid, and then converting the acids thus obtained by means of sulphuric acid into the corresponding respectively bromated oxynaphtacenchinons.

PRODUCTION OF RESINOUS SUBSTANCES.

George Fry, of Berwick-upon-Tweed, England. Patent No. 754,298, dated March 8, 1904.

This invention consists, first, in the formation of a nitro com-

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pound caused by the action of nitric acid intimately mixed with turpentine, oil of turpentine, colophony, raw oil, or with suitable mixtures, combinations, or solutions of these various vegetable substances; second, in the decomposition of this nitro compound by a gentle heat, preferably that of a water-bath; third, in the modification of the substances produced by these two operations of nitrification and oxidation by the regulated action of heat.

To produce in the dry way from colophony a resin suitable for making varnish, one hundred parts (by weight) of colophony are reduced to fine powder in a porcelain mortar. Then ten to thirty parts (by volume) of nitric acid are kneaded into it drop by drop, the formation of lumps being avoided. The result is a granulated powder of a dark olive-green color, generally stable at ordinary atmospheric temperatures. This nitrocolophony is now introduced in small successive quantities into a porcelain basin over a boiling-water bath. It soon fuses, becomes brown, then begins to froth and emit vapor and gas. The resulting yellow resin may remain over the water-bath for sufficient time to drive off any residual water and then is suitable for turpentine, oil, or spirit varnish. If a deeper color or harder resin is desired, the resin may be allowed to cool, again pulverized, and the described processes repeated indefinitely. The color or hardness may be also increased by the action of heat.

PROCESS OF MAKING CYANIDES AND NITRATES.

Willis Eugene Everette, of Tacoma, Washington. Patent No. 754,647. dated March 15, 1904.

The claim covers a process of forming cyanides and nitrates, which consists first in reducing a mixture of pulverized material containing carbon to an intense crymic condition by contact with liquid air; second, subjecting said mixture while still in said intense crymic condition to contact with intense heat in the form of incandescence, thereby producing a violent disruption of the elements contained in said mixture; and third, collecting the

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cyanides, acids, ammonia, nitrates, and other nitrogenous derivatives formed by the union of the nitrogen of the air with the disrupted elements separated by said explosion and preparing them for commercial use.

PROCESS OF MAKING AMMONIUM NITRATE.

Walter Mills, of London, England, assignor to A. O. Granger, of Cartersville, Ga. Letters Patent No. 754,668, dated March 15, 1904.

The claims cover:

1. The process of making ammonium nitrate, which consists in first forming silicofluoride of lead; then converting the same into the nitrate; and finally reacting upon the nitrate of lead with fluoride of ammonium.

2. The process of making ammonium nitrate which consists in heating a mixture of lead or lead-carrying compound and hydrofluorsilicic acid of about 1.80 specific gravity; in adding a nitrate to a solution of the lead silicofluoride so formed; and in finally decomposing the lead nitrate with ammonium fluoride. The basis of the process is the same as described in Patent No. 755,378.

PROCESS OF MAKING SULPHATE OF ALUMINIUM.

Howard Spence, of Manchester, England. Patent No. 754,824, dated March 15, 1904.

The process for the manufacture of crystallized sulphate of alumina containing two molecules of SO_3 for each molecule of Al_2O_3 consists in subjecting alumina in excess to the action of hot sulphuric acid under pressure so as to obtain a solution of sulphate of alumina containing an excess of alumina. This solution is then treated with available lime suspended in water until the desired basicity is obtained and the resulting mixture filtered. The filtered solution is evaporated and the crystallized basic sulphate separated.

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PROCESS OF MANUFACTURING HYDROFLUORIC ACID.

Charles A. Doremus, of New York, N. Y. Patent No. 754,978, dated March 22, 1904.

This process consists in treating with an excess of finely ground zauxite or kaolin either hydrofluorsilicic acid or a mixture of hydrofluorsilicic acid and hydrofluoric acid until a perfectly neutral solution of aluminium fluoride is thereby obtained, the fluorsilicate which is first formed being decomposed by the excess of aluminous material to yield the fluoride and a precipitate of silicic acid, which, together with insoluble substances, is separated by filtration. The aluminium fluoride may be obtained in crystalline form, either by cooling or by evaporation. When dry, the fluoride is placed in an iron retort and there heated to redness. This retort has an outlet which connects with a leaden condenser. When the fluoride is red-hot, it is subjected to the action of superheated steam, which is introduced into the retort. Hydrofluoric acid of great purity is rapidly evolved and condensed. Aluminium oxide remains in the retort. The yield of acid from the fluoride is practically theoretical. Other metallic fluorides yield similar results.

PROCESS OF MANUFACTURING SODIUM SULPHIDE.

John Fleming White, of Buffalo, N. Y., assignor to General Chemical Company, of New York, N. Y. Patent No. 755,201, dated March 22, 1904.

This invention relates to the manufacture of sodium sulphide; and it consists in substituting nitre cake and salt for sodium sulphate in manufacturing sodium sulphide with the aid of coal. Nitre cake is obtained as a by-product in many chemical works manufacturing acids, and is for the most part acid sodium sulphate (NaHSO_4). It is very cheap.

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According to this process, the crude acid sodium sulphate, commonly known as "nitre cake," and salt are mixed with coal, and the reaction is brought about by heating the mixture in an open furnace or other suitable apparatus. The salt (NaCl) acts on the acid sulphate of sodium (NaHSO_4) and forms neutral sulphate of sodium and hydrochloric acid. The sulphate of sodium (Na_2SO_4) is then reduced to sodium sulphide (Na_2S) by the action of the coal.

MANUFACTURE OF SULPHURIC ACID.

Pedro G. Salom, of Philadelphia, Pa. Patent No. 755,247, dated March 22, 1904.

The underlying principle of operation which is characteristic of the present process is the oxidation of sulphurous-acid gas in the presence of water by means of electrolytic action, the current of gas being subjected to progressive treatment in a series of divided receptacles through which it travels. The process is so conducted as to permit the progressive transfer from time to time of the contents of each receptacle into the next one of the series and the discharge of the contents of the ultimate receptacle (in which the action has proceeded to the fullest extent) into a receiving vat or tank, the travel of the liquid contents being in the inverse direction to the flow of the gas through the same.

MANUFACTURE OF THE BENZOLES AND THEIR HOMOLOGUES.

Alexander Nikiforoff, of Moscow, Russia. Patent No. 755,309, dated March 22, 1904.

This invention is based on the fact that crude petroleum and the heavy hydrocarbons, besides containing hydrocarbons of the paraffin series, also contain hexahydrocyclic compounds. It is found by subjecting to the combined effect of high temperature

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and pressure the volatilized products resulting from the decomposition of the raw materials referred to and having a boiling-point below approximately 200° C. the dehydrogenation of the more or less simple hydrocarbons and to effect the decomposition with subsequent dehydrogenation of the more or less complex hydrocarbons is effected, resulting in the formation of benzole and of a whole series of its derivatives, such as toluol, xylol, cumol, naphthalene, anthracene, etc.; and when the original raw material is free from sulphur the resulting benzole obtained is entirely free from thiophene, the presence of which is unavoidable and detrimental in connection with benzole as obtained by other processes heretofore suggested and which requires elaborate treatment for its removal.

Benzole, toluol, and other hydrocarbon combinations of the aromatic series obtained by this process are identical in their properties with corresponding combinations secured by other processes at the present time. Thus, for instance, the benzole obtained is capable of being fully nitrated into nitrobenzole, while the anthracene can be converted into alizarine with perfect dyeing properties.

The object is to provide a new and useful process for the treatment of heavy hydrocarbons for the production therefrom of benzole, its homologues and compounds of the aromatic series which shall be simple, effective, and capable of operation under conditions of the highest economy.

METHOD OF MAKING NITRIC ACID.

Walter Mills, of London, England, assignor to A. O. Granger, of Cartersville, Ga. Patent No. 755,378, dated March 22, 1904.

In carrying out this process of manufacturing nitric acid, excess of scrap lead or crushed ore is placed in a pan or other receptacle, and a proper amount of acid is added, and heat is applied until the mass is substantially dry. In practice the warm acid begins to attack and dissolve the substance when the specific gravity of the acid is about 1.80, and if scrap lead is employed the action of

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the acid is somewhat accelerated by blowing air through the mixture. If warm water is now added to the dried mass, an aqueous solution of silicofluoride of lead is obtained, which after being filtered is ready for use. The next step in the practice of the present process consists in the preparation of an aqueous solution of nitrate of lead from the solution of silicofluoride. This is usually accomplished in practice by adding thereto the nitrates of the elements calcium, potassium, or sodium either in aqueous solution or in a fine state of division. The silicofluoride of the respective metal is precipitated, while nitric of lead remains in solution. From this solution of nitrate of lead nitric acid may be formed by adding sulphuric acid. The strength of the nitric acid thus produced depends upon the specific gravity of the liquids employed. The sulphate of lead produced as a result of the reaction is precipitated. The solution of nitric acid may be drained therefrom and afterward concentrated by evaporation.

MANUFACTURE OF DEXTRINE.

Georges Reynaud, of Paris, France. Patent No. 755,390, dated March 22, 1904.

This process consists, essentially, in diluting the material to be treated in twice its weight of water and in heating the resultant mass under pressure in an autoclave or digester at a temperature of 160° to 220° C. for about an hour and a half. Under the influence of this temperature the cellulose and the amylaceous matters of the peat under treatment become converted into dextrine or, more exactly, achroodextrine, which is capable of advantageously replacing ordinary dextrine in its industrial applications by reason of its lower density.

Hitherto achroodextrine has only been a laboratory product, because the processes employed for the manufacture of dextrine always give ordinary or erythro dextrine. This process, on the contrary, permits of obtaining achroodextrine industrially and directly.

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PROCESS OF MAKING ALPHA-OXYANTHRAQUINONE.

Robert E. Schmidt, of Elberfeld, and Paul Tust, of Vohwinkel, Germany, assignors to Farbenfabriken of Elberfeld Co., of New York, N. Y. Patent No. 755,801, dated March 29, 1904.

This process consists in causing alkaline earths to act on anthraquinone-alpha-sulphonic acid or its salts, which can be obtained by the action of sulphonating agents on anthraquinone in the presence of mercury or mercury compounds, as is described in the U. S. Patent No. 743,664. By means of this process alpha-oxy-anthraquinone (erythroxyanthraquinone) is obtained in a pure state.

OXIDIZING ORGANIC COMPOUNDS.

Martin Moest, of Höchst-on-the-Main, Germany, assignor to Farbwerke, vorm. Meister, Lucius & Brüning. Patent No. 757,136, dated April 12, 1904.

1. The claims are for process for oxidizing aromatic hydrocarbons and their substitution products, which consists in causing ceric compounds to act on said aromatic compounds.

2. The process for oxidizing aromatic hydrocarbons and their substitution products, which consists in causing the oxides of the cerite group to act on said oxy compounds in presence of acids.

3. The process for oxidizing aromatic hydrocarbons and their substitution products, which consists in causing ceric salts to act on said organic compounds.

PROCESS OF MAKING ORTHO-OXY-CARBON ACIDS.

Georg Wichmann, of Berlin, Germany, assignor by direct and mesne assignments to Chemische Fabrik auf Actien (vorm. E. Schering), of Berlin, Germany, and Société Chimique des Usines du Rhone. Patent No. 757,702, dated April 19, 1904.

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The object of this invention is to produce ortho-oxy-carbon acids in great purity and with a better yield than by former methods; and this is reached by subjecting to carbonic-acid treatment a mixture of the alkaline salt of a phenol with sulphite.

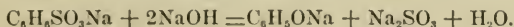
The term "phenol" is here used in a sufficiently broad sense to comprise not only phenol and its homologues, but also, for example, the naphthols and the like.

An addition of one part, by weight, of, for example, crystallized sodium sulphite to ten parts, by weight, of phenol has proved sufficient for the purpose. The mixture is made most conveniently by uniting a concentrated solution of the sodium sulphite with soda-lye and pouring liquid phenol into this mixture.

An analogous procedure is followed to produce ortho and para cresotinic acid, alpha and beta oxy-naphthoic acid by starting with corresponding quantities of ortho or para cresol or alpha or beta naphthol. The mixture of sodium phenol and sodium sulphite may also be produced by mixing dry sodium phenolate or sodium cresolate (ortho or para) or sodium naphthalate (alpha or beta) with anhydrous sodium sulphite.

Instead of the sodium combinations the corresponding quantities of potassium combinations may everywhere be used, and instead of sodium or potassium sulphite other suitable sulphites may be used.

Also, instead of producing a mixture of the alkaline phenol and a sulphite in the manner described, it is advantageous to use the mixture of alkaline phenol and alkaline sulphite, resulting from the synthetic production of phenol from benzol-sulpho-acid alkali by fusing with caustic alkali. The reaction will be according to the following equation:



Other ortho-oxy-carbon acids—such as ortho and para cresotinic acid, alpha and beta oxy-naphthoic acid—may also be obtained in the like manner.

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PROCESS OF MAKING SULPHURIC ANHYDRIDE.

Georg Lunge, of Zürich, Switzerland, and George Paton Pollitt, of Stanford Le Hope, England, assignors to Verein Chemischer Fabriken in Mannheim. Patent No. 758,844, dated May 3, 1904.

This invention relates to improvements in the well-known process of manufacturing sulphuric anhydride, in which process the gases containing sulphurous acid and air or the gases derived from ore-roasting are passed over a heated metallic oxide (such as ferric oxide), acting as a contact substance, the object of the said improvements being to render the contact substance more efficient in its action. It has been found that the presence of arsenic in the said contact substance increases its catalytic action, and in accordance with the present invention the contact substance used is metallic oxide, such as ferric oxide or a mass containing such oxide (such as the residue of the calcination of pyrites), this oxide or mass being prior to its use charged with arsenic.

PROCESS OF MAKING COMPOUNDS OF TITANIC AND LACTIC ACIDS.

Carl Dreher, of Freiburg, Germany. Patent No. 760,319, dated May 17, 1904.

The claims cover:

1. The process for obtaining a water-soluble and permanent compound composed of titanic and lactic acid in the proportion of one molecule of the former to four molecules of the latter, which consists in dissolving titanic acid in a strong acid, mixing the solution thus produced with a quantity of lactate sufficient to recover by means of the metal of the lactate the acid used for dissolving the titanic acid, then filtering and boiling down the filtrate.

2. The process for obtaining a water-soluble and permanent compound composed of titanic and lactic acid in the proportion of one molecule of the former to four molecules of the latter,

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which consists in dissolving titanio acid in hydrochloric acid, mixing the solution thus produced with a quantity of lactate sufficient to recover by means of the metal of the lactate the acid used for dissolving the titanio acid, then filtering and boiling down the filtrate.

3. As a new article of manufacture, a stable compound composed of titanio and lactic acid in the proportion of one molecule of the former to four molecules of the latter, the said compound being a hygroscopic mass soluble in water and in alcohol, but insoluble in ether and obtainable by the process described above.

PROCESS OF EVAPORATING ALKALINE SILICATE SOLUTIONS.

Carl Reim, of Odessa, Russia. Patent No. 760,563, dated May 24, 1904.

The inventor has discovered that when the solution of silicate of alkali to be found in the trade which is in a pure condition and ready for use is evaporated only to such a point, when the solution is about to change from the liquid to the solid state, care being taken that at this moment the further evaporation of the obtained matter is stopped and the evaporation of the whole contents of water is prevented, a silicate of alkali in a solid condition will be obtained, which can be finely powdered and which is easily soluble in water, especially in cold water. Upon this discovery is based the new process.

PROCESS OF MAKING ALCOHOL.

Stonewall J. Vance, of Mountaingrove, Mo. Patent No. 760,939, dated May 24, 1904.

This invention relates to the manufacture of spirits from grain or other amylaceous materials, and has for its object the provision of means whereby the percentage of spirits obtained is materially increased.

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The process is designed to cause a more complete conversion of the starchy constituents of the amylaceous material into sugar than has been possible under the processes heretofore known, the result of the conversion being such forms of sugar as offer the least resistance to the action of the fermenting agent. This result is reached by the addition to the primary amylaceous material of a certain quantity of ammonia, which not only attacks, enters into, and decomposes all of the intercellular tissue of the amylaceous material without the aid of heat of high degree or heavy and continued pressure, thereby causing a more complete exposure of the carbohydrates to the action of the diastase of malt, but also aids the diastase of malt in converting the starch into glucose rather than dextrine, thus offering less resistance to the action of the yeast.

PROCESS OF MAKING HALOGEN-TERTIARY-BUTYL ALCOHOL.

Thomas B. Aldrich, of Detroit, Mich. Patent No. 761,188, dated May 31, 1904.

The invention relates to the art of producing halogen-tertiary-butyl alcohols. Of the various compounds included in this class that best known is tri-chlor-tertiary-butyl alcohol, also known as acetone chloroform, tri-chlor tri-methyl carbinol, tri-chloride of acetone acid, and tri-chloride of oxyisobutyric acid.

The invention consists in an improved process which may be specially employed for the production of the above-named compound, and which is generically applicable to the production of other compounds included in the class of halogen-tertiary-butyl alcohols.

Heretofore tri-chlor-tertiary-butyl alcohol has been manufactured from acetone and chloroform.

It is one of the objects of the present invention to reduce the cost of manufacture by the employment of less expensive materials than heretofore used.

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The essential novelty of the invention, therefore, consists, first, in dispensing with the use of chloroform as one of the primary materials and in obtaining the necessary halogen substitution products by the treatment of ketones; second, in the modified process in which the ketones are first obtained by the treatment of other materials.

PROCESS OF MAKING HALOGEN-TERTIARY-BUTYL ALCOHOL.

Thomas B. Aldrich, of Detroit, Mich. Patent No. 761,189, dated May 31, 1904.

The invention relates to the art of producing halogen-tertiary-butyl alcohols.

The invention more particularly consists in a novel process for the production of a specified compound tri-brom-tertiary-butyl alcohol; but in its broader application it may be employed for the manufacture of other compounds of the class.

In the old process a mixture of a halogen substitution product, such as chloroform or bromoform, and a ketone, such as acetone, is treated with a condensing agent, such as caustic alkali, the relative quantity of the latter being about ten per cent. of the mixture of the other two materials.

The present invention is based on the discovery that the yield of the desired product is materially increased and the formation of objectionable by-products and the destruction of the materials is greatly diminished by the use of a relatively small quantity of condensing agent. As before stated, the quantity of condensing agent heretofore used has been not less than ten per cent. of the mixed materials. With this process it is found that the best results are obtained by the use of from one-fourth to one and one-half per cent. of the condensing agent. A further improvement is made in the method of separation, so that loss of the already formed product does not occur.

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PROCESS OF RECOVERING WOOL-FAT.

Charles E. Swett, of Providence, R. I., assignor of one-half to Robert H. Hutchison, of New York, N. Y. Patent No. 761,265, dated May 31, 1904.

This process is as follows: To the fresh, cool, greasy water an oxidizing agent, preferably an alkaline manganate or permanganate, is added. If an alkaline manganate or permanganate be used, the further addition is stopped when the color imparted to the water by such addition disappears rather slowly from the solution. Then an alkali-neutralizing agent or acid is added until the fat in dilute solution and emulsion is separated and rises to the surface of the water as a thick magma. This magma is then removed, and the grease is separated therefrom in any approved manner, as by the expression of the free moisture in a press or by removing the greater portion of the water by mechanical means and recovering the grease from the resulting mass by the action of a volatile solvent—such as, for instance, carbon disulphide or petroleum-naphtha, the petroleum-naphtha being generally preferable.

PROCESS OF MAKING ACHROO-DEXTRINE.

Georges Reynaud, of Paris, France. Patent No. 761,542, dated May 31, 1904.

This invention relates to a process for the treatment of acid peats.

This process consists, essentially, in diluting the peat in three to five times its weight of water and in heating this dilution in a digester under a low pressure at a temperature of 110° to 150° C., according as the peat to be treated is more or less acid. The length of the operation may also be varied according to the degree of acidity of the peat. Under the influence of this temperature and of the humic acid which is contained in the peat, the amylaceous matters of the latter begin to be converted after about twenty minutes of treatment in dextrine or, more exactly,

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achroo-dextrine. The operation is entirely finished in about one hour and even less, if the peat is very acid. The aqueous solution withdrawn from the digester may then be employed directly for the industrial exploitation of the achroo-dextrine, or it may be submitted to a second operation for the purpose of converting it into alcohol.

This process permits of obtaining industrially, not erythro-dextrine as the processes ordinarily employed for the manufacture of dextrine, but directly achroo-dextrine capable of advantageously replacing dextrine in its industrial applications by reason of its lower density.

PROCESS OF MAKING FATTY ACIDS.

Wilhelm Connstein, of Charlottenburg, Germany, assignor to Vereinigte Chemische Werke Actien-Gesellschaft. Patent No. 762,026, dated June 7, 1904.

The inventor has found that the decomposition of the fats can be rendered possible and available for purposes of manufacture on a large scale by means of the ferments contained in many plants and in particular in the *Euphorbiaceæ*, more especially the *Ricinus* (castor-oil) varieties of that order of plants, by causing the ferments to exercise their action in an acid solution, by which mode of procedure the esters are decomposed nearly quantitatively.

The claims cover:

1. The process of decomposing fatty-acid esters into their acids and alcohols, which consists in providing a medium of acid reaction, emulsifying said esters to be treated and subjecting said emulsion in the presence of the said medium of acid reaction to the action of the fat-decomposing ferments present in oil or fat-bearing plants.

2. The process of decomposing fatty-acid esters into their acids and alcohols, which consists in providing a medium containing

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free acid, emulsifying the esters to be treated and subjecting said emulsion in the presence of said free acid to the action of the fat-decomposing ferments present in ricinus-seed.

PROCESS OF DESTRUCTIVE DISTILLATION OF WOOD.

George O. Gilmer, of New Orleans, La., assignor by mesne assignments to Illinois Investment Company. Patent No. 762,303, dated June 14, 1904.

This invention is an improved process for producing turpentine, tar, wood-alcohol, and other products, including charcoal, from fat pine; and the invention has for its salient object to provide a practical process whereby the various distillates may be readily and effectually separated during the progress of the distillation and separately taken off in such manner as to more completely separate the several distillates from each other, and thus enhance the purity and value of each.

PROCESS OF MAKING NITROUS ANHYDRIDE AND NITRITES.

Hermann von Kéler, of Leverkusen, near Cologne, Germany, assignor to Farbenfabriken of Elberfeld Co., of New York, N. Y. Patent No. 763,491, dated June 28, 1904.

This process consists in passing a mixture of ammonia with an excess of oxygen or atmospheric air over oxides of heavy metals—such as iron oxide, copper oxide, mixtures of these oxides, or the like—which bodies are heated to about from 650° to 750° C. It is practical to employ as metal oxides desulphureted burnt pyrites, which, as is known, consist for the most part of iron oxide and a small quantity of copper oxide. For the production of nitrites the resulting nitrous anhydride is allowed to act on alkalies or alkaline carbonates, or the like.

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PREPARATION OF SALTS OF IRON FOR USE IN OIL-COLORS.

Raymond Vidal, of Paris, France. Patent No. 763,574, dated June 28, 1904.

This process consists, first, in treating reducible matters—such as nitro benzol, oxyazo benzol, nitro or dinitro phenol, nitro or dinitro cresols, and nitro or dinitro naphthols, nitroso phenols, nitroso cresols, or nitroso naphthols, nitro naphthalenes, dinitro naphthalenes, etc.—with a heated aqueous solution of sulphate of iron and with turnings or filings of cast-iron or wrought-iron.

In the above-mentioned reactions the proportions of sulphate of iron may be increased or decreased, so as to cause the quantity of sulphur of the mixture to be varied and even to obtain them mixed with oxides of iron.

The polybasic sulphates mixed with oxide of iron are separated out by filtration from the solution of the aromatic compound produced by reduction, and they are then treated in the following manner: They are placed in a furnace wherein they are moderately heated, about 80° C., in such a manner that they are not calcined and that the residue of iron is burned (because of the particular property of the mixture of protoxide of iron and sulphate of iron), evolving sulphurous vapors.

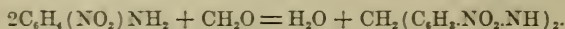
An impalpable powder remains which assumes on cooling shades or tints varying according to the composition of the residual sulphates of iron, these shades or tints varying between orange yellow, violet-tinged reds, yellow browns, or red browns, or violet-tinged browns. They can in this state be employed directly in oil-colors without requiring an intermediary grinding.

PROCESS OF REACTING ON NITRAMINES WITH FORMALDEHYDE AND A PRODUCT THEREOF.

Benno Homolka, of Frankfort-on-the-Main, and Josef Erber, of Höchst-on-the-Main, Germany, assignors to Farbwerke, vorm. Meister, Lucius & Brüning. Patent No. 763,756, dated June 28, 1904.

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It has been shown that the three nitranilines in alcoholic solution with formaldehyde yield yellow to orange-yellow products of condensation, according to the equation:



These products of condensation have now been recognized as valuable lake dyestuffs, and it was desirable to substitute for their tedious and expensive manufacture in alcoholic solution a cheaper and more handy method.

The inventors have found that the products of condensation of nitranilines and their homologues, especially of nitrotoluidines with formaldehyde, may be easily obtained if the aldehyde is allowed to act on the aqueous solution of a salt, preferably the hydrochloride of nitramine. This result was not to be foreseen, as various products are obtained according to the action of formaldehyde on aromatic amines occurring in neutral, acid, or alkaline solution.

The claims specify as a new substance, the product of reaction of formaldehyde on nitroörrhotoluidine $\text{CH}_3\text{:NH}_2\text{:NO}_2 = 1:2:4$, melting-point 107°C ., being a yellow crystalline powder melting at 230°C ., insoluble in water, almost insoluble in the usual organic solvents, soluble in hot glacial acetic acid.

PROCESS OF PRODUCING NITRATE OF AMMONIUM.

Emil Naumann, of Cologne, Germany. Patent No. 764,251, dated July 5, 1904.

This invention has reference to a novel process of producing nitrate of ammonium from nitrate of sodium and sulphate of ammonium.

The process consists in preparing a mixed aqueous solution of these salts and boiling down said solution, precipitating thereby sulphate of sodium. The hot mother-liquor is separated and cooled down to about the limit of its saturation for nitrate of

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ammonium whereby the double salt of ammonium sodium sulphate is precipitated.

The new mother-liquor is now separated from the double-salt precipitation and subjected to a compulsorily accelerated but otherwise undisturbed cooling by which practically nitrate of ammonium alone is precipitated, and separated from the lye and refined to any desired degree.

PROCESS OF MAKING COPPER SULPHATE.

Gustave Gin, of Paris, France. Patent No. 765,000, dated July 12, 1904.

The claim is for the process of obtaining sulphate of copper from sulphur ores or mattes, which consists in roasting the ores in an oxidizing atmosphere until the sulphur is dispelled from the ore, cooling the roasted ore in contact with the gases from the roasting to form sulphate of copper and ferric sulphate; lixiviating the mass thus formed, then digesting the solution with ore previously roasted to complete oxidation whereby sulphate of copper is formed and peroxide of iron is precipitated.

PROCESS OF MAKING ANTHRARUFINE.

Robert E. Schmidt, of Elberfeld, and Paul Tust, of Vohwinkel, Germany, assignors to Farbenfabriken of Elberfeld Company, of New York, N. Y. Patent No. 765,201, dated July 19, 1904.

This new process consists in causing alkaline earths—such as slaked lime, baryta water, or the like—to act on 1-5-anthraquinone disulphonic acid. This acid can be obtained according to the process described in the U. S. Patent No. 742,910.

In carrying out the process practically proceed as follows: In an autoclave provided with a stirrer a mixture of the sodium salt of 1-5-anthraquinone disulphonic acid, calcium hydroxide ($\text{Ca}[\text{OH}]_2$), and water is heated to from 180° to 190° C. for

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about twelve hours while stirring. After cooling the resulting anthrarufine is precipitated from the reaction mass by the addition of hydrochloric acid. It is then isolated by filtration. The process proceeds in an analogous manner if other alkaline earths or if mixtures of these bodies be employed.

PROCESS OF MAKING SULPHURIC ACID.

Auguste Lucien Stinville, of Paris, France. Patent No. 765,520, dated July 19, 1904.

This process consists, essentially, in establishing in the dish or dishes of the lead chambers a more or less active circulation of acid at such a strength and temperature that its tension of water-vapor shall be sufficient to supply by evaporation the quantity of water-vapor required for the reactions. As the tension of water-vapor depends simultaneously on the degree of concentration and on the degree of temperature, the contrivances used for carrying out my process allow of regulating the degree of concentration by the addition of water and the degree of temperature by refrigeration. A like degree of vapor tension can be obtained at divers temperatures provided the strength shall correspond. It will be preferable to take the lowest possible temperatures.

In practice the temperature and the degree of concentration are bound together by this condition, that while lowering the temperature as much as possible the mixture of acid and water must only allow to evaporate the quantity of water strictly required for the reactions. If the mixture is very cold and contains but little water, it can cool as much as if it were not so cold and more diluted; but in the first case it may not supply a sufficient quantity of water-vapor, and in the second case it may supply too much water-vapor, so there is a more favorable proportion to observe in each plant and sometimes in each chamber.

While a lead chamber fed with water exclusively by the gases in the kiln and by a boiler or exhaust engine-steam supplies

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normally a given weight of acid at a definite number of degrees Baumé per day, the present process causes the circulation through the chambers of a weight of acid four or five times as great and having a density lower by 3° to 5° Bé. and a temperature lower by 15° to 25° C. than the gases in the chambers. Besides the greater turn-out given by the chambers in my process a great decrease is obtained in the quantity of steam to be introduced into the chambers for a determined production of acid.

PROCESS OF MAKING OMEGA CYANMETHYL-ANTHRANILIC ACID.

Otto J. Graul, of Ludwigshafen-on-the-Rhine, Germany, assignor to Badische Anilin und Soda Fabrik. Patent No. 765,576. dated July 19, 1904.

By condensing together anthranilic acid and formaldehyde under appropriate conditions there results a body apparently dependent on the union of equal molecular proportions of anthranilic acid and formaldehyde, but which probably does not possess the accepted constitution of the ordinary so-called "Schiff" bases since it does not dissolve in dilute caustic-soda or dilute carbonate-of-soda solution (containing five per cent. of NaOH or Na_2CO_3) and is therefore different from the condensation product of formaldehyde and anthranilic acid described in the specification of Patent No. 718,340. It appears to be identical with the body obtained by treating anthranilic acid with formaldehyde and hydrocyanic acid, according to the method of v. Miller and Plöchl, as described in the German Patents Nos. 117, 924 and 120,105, but in the formation of which body the hydrocyanic acid does not take part. Owing to this apparent lack of chemical affinity for hydrocyanic acid, the aforementioned condensation product has not been used in the manufacture of omega cyanmethyl-anthranilic acid. It is now discovered that under suitable conditions this insoluble condensation product can be caused to react with cyanides to

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form omega cyanmethyl-anthranilic acid. This treatment may either be direct or an intermediate treatment with a sulphite, or bisulphite may, if desired, be interpolated.

PROCESS OF PURIFYING INDIGO.

Paul Erwin Oberreit, of Ludwigshafen-on-the-Rhine, Germany, assignor to Badische Anilin und Soda Fabrik. Patent No. 765,590, dated July 19, 1904.

Indigo, both natural and synthetic, frequently contains, as is known, certain impurities. It is now discovered that the impurities which occur more especially in commercial synthetic indigo can be removed by heating such commercial indigo to temperatures below the sublimation or decomposition point of indigo—that is, to between 200° and 270° C. By this means the red admixtures are destroyed without the indigo itself being injured. The decomposition products of the impurities partially escape as gas, so that the product remaining possesses a higher percentage of indigo than the original product.

PROCESS OF MAKING CHRYSAZINE.

Robert E. Schmidt, of Elberfeld, and Paul Tust, of Vohwinkel, near Elberfeld, Germany, assignors to Farbenfabriken of Elberfeld Company, of New York, N. Y. Patent No. 765,637, dated July 19, 1904.

This process consists in causing alkaline earths such as calcium hydroxide, barium hydroxide, and the like to act on 1.8-anthraquinone disulphonic acid, which may be obtained according to the process described in U. S. Patent No. 742,910.

Practically, this process is used: In an autoclave provided with a stirrer a mixture of the potassium salt of 1.8-anthraquinone disulphonic acid, crystallized barium hydroxide ($\text{Ba}[\text{OH}]_2$), and water is heated to from 170° to 180° C. for about ten hours while stirring. After cooling the resulting chrysazine is precipitated

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from the reaction mass by the addition of hydrochloric acid. It is then isolated by filtration.

The process proceeds in an analogous manner, if other alkaline earths, such as strontium hydroxide, etc., or if mixtures of these bodies be employed.

PROCESS OF MANUFACTURING GLUE OR SIZE.

Pedro Fargas-Óliva, of Barcelona, Spain. Patent No. 768,274, dated August 23, 1904.

This invention relates to a process for the manufacture of glue or size especially adapted for the warp-threads of fabrics.

Examination of the substances hitherto used for the finishing, sizing, or gumming of warp-threads of fabrics will show that none of them completely answers all the requirements of textile manufacture.

The object of the invention is to remove this disadvantage by providing a substance which answers all the requirements in question. The process used for this purpose essentially consists in the use as a basic material of gluten treated with a liquid containing substance or substances adapted to act on and transform the gluten by fermentation and when the transformation has taken place to the desired degree further treated with an anti-fermentative substance or substances to prevent subsequent fermentation and preserve the preparation in permanent condition with adhesive properties.

For applying the product it is mixed with the same kind of materials as have been used, but in a much smaller proportion. It renders the thread stronger and more durable than any size hitherto used for the purpose.

The ordinary mixing substances are, for instance, flour, meal, fecula, and earthy substances. These are mechanically mixed with the gluten to form a homogeneous paste, which is allowed to stand for some time, then pressed, and divided into pieces. These pieces are pressed as thin as possible to increase homogeneity

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and facilitate drying. An unalterable product is thus obtained which is finely pulverized when dry. On the other hand, the proportion of charge of the dressing can be increased to up to seventy per cent. of the weight of the fabric, according to the condition of the latter.

PROCESS OF FORMING ORGANIC PEROXIDE ACIDS.

Alphonso M. Clover, of Ann Arbor, Mich. Patent No. 765,562, dated August 23, 1904.

The invention relates to the manufacture of a class of compounds which may be designated as "organic peroxide acids" and which, as the title suggests, are characterized by possessing the properties of both a peroxide and an acid.

The process is applicable to the manufacture of various specific compounds of this class, of which the compound succinic peroxide acid may be taken as a specific case.

Broadly described, the process consists in the treatment of an anhydride of a dibasic acid with a solution of hydrogen peroxide. This treatment is preferably effected by taking a suitable quantity of the pulverized anhydride and mixing it with a solution of the hydrogen peroxide. The mixture is then agitated until a precipitate is formed which consists of the peroxide acid in pure condition.

PROCESS OF CALCINING ALUMINA SULPHATE, ETC.

Albert E. Cummer, of Cleveland, O. Patent No. 769,534, dated September 6, 1904.

This invention consists in comminuting the material to be treated, subjecting it to the action of heat just below the temperature at which the particles would become incrustated or glazed through the melting of their surfaces, and constantly increasing

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the temperature as the melting-point of the material advances through the elimination of the moisture. In practice it has also been found in spite of all precautions that some of the material becomes overheated during the early part of the process, possibly through an excess of moisture above the estimated quantity, and some of the particles become incrustated and glazed through the melting of their surfaces. These glazed and incrustated particles will not readily part with the moisture contained in them during the remainder of the process. Also when in such form near the end of the process and when the application of heat has almost reached the limit the particles burst into flocculent masses. As the glazing and incrusting generally occur during the early application of heat and as the bursting occurs during the latter application, there is a considerable interval of time during which the particles can be treated to avoid the bursting and whereby advantage can be taken of the calcination through which such particles have already passed.

This trouble is overcome by crushing the material during the process by which the glazed particles are broken up.

PROCESS OF MAKING SULPHURIC ANHYDRIDE.

Henry Spencer Blackmore, of Mount Vernon, N. Y. Patent No. 769,585, dated September 6, 1904.

This invention relates to certain new and novel features and steps for performing a reaction between sulphur dioxide and oxygen, thus producing sulphuric anhydride without depending upon so-called "contact substances" or catalytic action—such as platitized asbestos, etc.—which soon become inoperative by absorption or saturation of gases and have to be regenerated by expensive chemical process to regain their activity; and it consists in supplying heat to a refrigerated gaseous body containing sulphur dioxide and oxygen, said heat being generated by a source of energy other than the chemical combination between the sulphur

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dioxide and the oxygen employed, whereby sulphur dioxide and oxygen may be united, producing sulphuric anhydrid in a positive and continuous manner at will, the thermal condition of the reacting or combining ingredients being maintained below the dissociating-point of sulphuric anhydride by the abstraction of heat therefrom by the action of the refrigerated gas or fluid associated therewith.

METHOD OF TREATING WOOD FOR THE PRODUCTION OF PAPER-PULP, TURPENTINE, ETC.

William Hoskins, of Lagrange, Ill. Patent No. 770,463, dated September 20, 1904.

This invention relates to an improved method of obtaining from wood in an economical manner valuable products, constituent parts of the wood, by a procedure that will render such products desirable and merchantable.

While it is not limited to the treatment of any particular species of wood, it is more especially adapted for separating and saving the valuable constituent parts of fatty wood—such, for example, as the more resinous varieties of pine.

The process consists in subjecting the wood in a digester to the action of steam at a temperature below that which would cause destructive distillation of the resins, to separate therefrom the volatilizable condensable constituents and melt out resinous constituents, carrying off, condensing, and saving any volatilized constituents and withdrawing the resinous constituents of the wood, in said digester. are subjected to the action of caustic soda or other chemical, to reduce the wood to pulp, which is then withdrawn and saved. The liquors are then concentrated and then the said concentrates destructively distilled, to produce therefrom tarry and oily products, and finally the residuum is leached to recover the chemicals.

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PROCESS OF MAKING HYDROXY STEARIC ACID.

William M. Burton, of Chicago, Ill., assignor to Standard Oil Company, of Chicago, Ill. Patent No. 72,129, dated October 11, 1904.

This process consists in manufacturing hydroxy stearic acid from oleic acid by diluting the oleic acid with a suitable diluent, preferably a liquid hydrocarbon, converting the mixture to a saturated oleic acid by adding thereto a suitable polymerizing agent, such as zinc chloride, but the best results are obtained with sulphuric acid.

Steam is introduced into the resultant solution, thereby converting the oleic acid into hydroxy stearic acid. The acid mixture separates, the water solution is drawn off, and the hydroxy stearic acid is purified by adding to the residual oils a suitable solvent, and cooling the solution. This reduces the pure hydroxy stearic acid to crystalline form, and finally the crystals are separated and dried.

PROCESS OF MAKING SOLUBLE STARCH.

William Browning and John James Barlow, of Acerrington, England. Patent No. 773,469, dated October 25, 1904.

This invention relates to an improved process for the production of soluble starch and dextrine; and the chief object of the invention is to produce soluble starch and dextrine from starch in the form of powder and acid in the state of gas, vapor, or fine sprays.

In carrying the invention into effect we employ the ordinary starch of commerce made from potatoes, tapioca, sago, wheat, maize, rice, or other kind of starch in the form of powder and the acid in the state of gas, vapor, or fine spray, which may be mixed together in any suitable apparatus; but in order that the soluble starch or dextrine may be produced in an economical and rapid manner the apparatus described in U. S. Patent, No. 773,783, is used.

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MANUFACTURE OF CELLULOSE.

Carl Kellner, of Vienna, Austria-Hungary. Patent No. 773,941, dated November 1, 1904.

The portions of plants from which cellulose is to be produced are in accordance with this invention treated with water, or preferably with milk of lime or a very weak solution of an alkaline carbonate or hydroxide, and after the excess of liquid has been removed by means of a hydro-extractor or otherwise—as, for example, by pressing—the portions of plants under treatment are subjected to the action of the chloride gas derived from the electrolysis of a metallic chloride. This action, together with that of the heat of solution or of combination evolved by the absorption or combination of the chlorine gas by the liquids contained in the portions of plants under treatment causes the incrusting substances (lignines) to be oxidized so extensively as to convert them into substances which, while in many cases completely soluble in hot water, are in all cases completely soluble in very weak alkaline liquids.

After suitable treatment to remove the now soluble substances the residue, consisting only of nearly chemically pure cellulose (vegetable fibre), is well washed with water and bleached, if desired, and is then dried and placed on the market or forwarded for or subjected to further treatment.

PROCESS OF RECOVERING GLYCERIN FROM SPENT SOAP-LYES.

William E. Garrigues, of New York, N. Y. Patent No. 774,172, dated November 8, 1904.

This invention has reference to a novel process of recovering glycerin from spent soap-lye, and pertains particularly to a process of eliminating soluble and volatile fatty acids from the raw material, so as to avoid contamination of the glycerin therewith. The raw material from which the glycerin is recovered is the waste lye from soap factories. When the soap

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solution is grained with salt, then the soap forms at the top of the kettle, while the waste lye settles at the bottom. This waste lye consists, essentially, of water, glycerin, the salt used for graining the soap, sulphate of sodium, carbonate of sodium, the excess of sodium hydroxide employed in the process, some soap and alkali salts of soluble and volatile fatty acids. These latter acids are present in certain proportions in all animal and vegetable fats.

The object of the present invention is to provide an improved process for recovering glycerin from said waste lye in a relatively pure condition. This object is obtained by eliminating practically all the fatty acids previous to distillation and rendering the remaining solution alkaline before distilling.

PROCESS OF MAKING ALCOHOL AND ALDEHYDE.

Henry Spencer Blackmore, of Mount Vernon, New York, assignor to Robert C. Mitchell, of Mount Vernon, N. Y. Patent No. 774,824, dated November 15, 1904.

The object of this invention is to produce alcohol and aldehyde directly from hydrocarbons either in gaseous or vaporous form by subjecting them to a process of oxidation below the dissociating-point of the alcohol and aldehyde produced; and it consists in simultaneously deoxidizing a metallic compound and oxidizing the adjacent hydrocarbon.

The invention relates especially to the production of methyl hydroxide (wood-alcohol) and formic aldehyde, but is not confined to these compounds, as it may be applied to the production of many other alcohols or aldehydes.

PROCESS OF NEUTRALIZING LIQUIDS EFFLUENT FROM WOOD-PULP MILLS.

Charles W. Doughty, of Augusta, Ga. Patent No. 775,525, dated November 22, 1904.

The objects of this invention are to decompose or remove

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sulphuric and sulphurous acids from the waste liquids effluent from wood-pulp of fibre-mills by neutralizing the acids and changing the character of said effluent into a harmless condition and a useful product by simple and inexpensive chemical means and mechanical devices. The basis of the process is the use of carbonate of lime or marl to neutralize the acidity of the liquids due to sulphurous and sulphuric acids, which are injurious to growing plants, precipitating the acids as insoluble lime salts. To complete the neutralization and render the liquid alkaline, a small quantity of ammonia is added, the proportions being about one pound of dried and powdered marl and two ounces of ammonia to one thousand gallons of water.

PROCESS OF MAKING AMMONIA.

Adolph Frank, of Charlottenburg, Germany. Patent No. 776,314, dated November 29, 1904.

This invention has relation to the manufacture of ammonia; and it consists in a novel process whereby the whole or substantially the whole of the nitrogen in the chemical can be converted into ammonia, and this result is obtained by reacting upon the cyanamide with water, either as such (free or in a combined state) or in the form of vapor or steam, of a suitable temperature and in the proportion of not less than three molecules (fifty-four parts, by weight) of water to two atoms (twenty-eight parts, by weight) of the nitrogen present in the cyanamide.

Instead of cyanamide any one of its salts can be used—as, for instance, calcium cyanamide (CaCN_2)—in which case the corresponding metal present in the salt is obtained in the form of a carbonate.

PROCESS OF MAKING SULPHUR TRIOXIDE.

Henry Spencer Blackmore, of Mount Vernon, N. Y. Patent No. 778,099, dated December 20, 1904.

This invention relates specifically to certain new and novel

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features and steps for performing a reaction between sulphur dioxide and gaseous oxidizing agents in the formation of sulphur trioxide, whereby a temperature sufficient to dissociate sulphur trioxide or preclude its formation is prohibited by abstracting the heat evolved in the formation of the sulphur trioxide by a simultaneously produced substance which absorbs heat on its formation, the ingredients being so apportioned and disposed that the heat evolved by one is taken up by the other to such a degree as to practically prevent the accumulation of heat to an injurious point. By properly apportioning the reacting ingredients the process of making sulphur trioxide may be carried on continuously, the reaction being induced by the direct application of controlled heat in preference to heat dislodged, generated, or produced through the mediation of catalytic or condensation action of finely divided metal or so-called "contact" substances (*Ganot's Physics*), such as platinized asbestos, etc., on gases present, which soon become inoperative by absorption, saturation of gases, or destructive action of injurious contaminations and can only be regenerated by expensive chemical process to regain their activity.

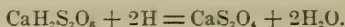
PROCESS OF PRODUCING SALTS OF HYDRO-SULPHUROUS ACID.

Albert Frank, of Charlottenburg, Germany. Patent No. 777,669, dated December 20, 1904.

This process consists in producing the hydrosulphites of alkali-earth metals or earth metals by electrolyzing a practically neutral solution of the bisulphite of the respective metal within a casing provided with a diaphragm in such manner that the bisulphite solution is contained in the receptacle in which the negative electrode is situated, while the positive electrode is situated in diluted sulphuric acid, alkali lye, or a suitable salt solution—as, for instance, a solution of caustic soda. During the electrolysis, as above described, the hydrosulphite of the earth

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metal—as, for instance, in case of a practically neutral solution of calcium bisulphite ($\text{CaH}_2\text{S}_2\text{O}_6$) being used the hydrosulphite of calcium (CaS_2O_4) deposits at the cathode in form of a heavy soluble crystalline mass. The reaction during the electrolysis is the following:



After the electrolysis is completed only a very small quantity of hydrosulphite of calcium remains in the solution. The hydrosulphite of calcium deposited at the bottom of the receptacle in which the cathode is situated will not be submitted to a secondary decomposition, as it is no more influenced by the current and does not come in contact with the atmospheric air on account of it being covered by a liquid. The output of salt with respect to the quantity of current is the greater the less acid is contained in the cathode liquid during the electrolysis, and it has proved advantageous to employ as cathode lye a solution of bisulphite of calcium, which, if possible, does not contain more sulphurous acid than corresponds to the formula: $\text{CaSO}_3 + \text{H}_2\text{SO}_3$. Equally high outputs are obtained when alkali lye or a solution of such a salt is used as anode liquid, which solution during the electrolysis secretes an alkaline ion, so that the liquid within the cathode-casing remains as neutral as possible. Evidently salts of similar metals—as, for instance, barium, strontium, magnesium, and aluminium—can be produced in the same way.

PROCESS OF MAKING ACETYL-SALICYL-PHENETIDINE.

Samuel Lewis Summers, of Philadelphia, Pa. Patent No. 778,556, dated December 27, 1904.

This invention relates to a new process for producing acetyl-salicyl-phenetidine, a chemical product described in Patent No. 706,356, dated August 4, 1902. The said product is the crystalline derivative having the chemical formula $\text{C}_{17}\text{H}_{17}\text{NO}_4$, resulting from

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the reaction of acetic acid and salicylic acid on phenetidine as the base. In said patent is described and claimed a process of producing it, which consisted in preparing a salicyl-phenetidine compound and then acetylizing this by means of acetic anhydride.

The present and newly invented process consists, speaking generally, in preparing a compound of acetic acid and salicylic acid and using this as an acetylizing agent, so to speak, causing it to react on para-amido-phenetol, the resultant crystals being then purified by washing or recrystallizing from ethylic alcohol, chloroform, or other suitable solvent.

PROCESS OF MAKING ACID NITRILES.

Otto J. Graul, of Ludwigshafen-on-the-Rhine, Germany, assignor to Badische Anilin und Soda Fabrik. Patent No. 778,656, dated December 27, 1904.

This invention relates to the manufacture of acid nitriles from the so-called "Schiff" bases and hydrocyanic acid. The preparation is effected according to this process by treating the said Schiff base after its formation with dilute aqueous or aqueous alcoholic solutions of hydrocyanic acid, provided that an elevated temperature be employed. The most favorable temperature for the purpose varies with different Schiff bases. In some cases the temperature of the water-bath is sufficient, but in others a somewhat higher temperature is necessary. It is preferable to work in closed vessels, as otherwise the hydrocyanic acid is liable to escape. No specially energetic shaking of the materials is necessary, and an ordinary vessel fitted with a stirrer is sufficient for use in the operation.

This invention renders it possible while using an ordinary dilute solution of hydrocyanic acid and a Schiff base powdered in the usual way without the use of any special apparatus and without any difficult treatment to obtain a practically quantitative yield of the desired nitriles.

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IV.—MACHINES.



WARP-PRINTING MACHINE.

George H. Winslow and Charles W. Dennett, of North Adams, Mass. Patent No. 750,514, dated January 26, 1904.

The object of this invention is to produce an improved machine for printing color designs upon warps preparatory to weaving the threads of such warps into figured fabrics in which the figure referred to is in whole or in part derived from the printing of the warp.

APPARATUS FOR DYEING, ETC.

Friedrich Cleff, of Rauenthal, near Barmen, Germany. Patent No. 750,601, dated January 26, 1904.

The method of dyeing, mordanting and otherwise treating fabrics by forcing the dyeing or other liquid through a perforated pipe carrying the fabric is well known and likewise the system of treating the fabric on a winding-frame rotating in the vat of liquid, on which the fabric is coiled on bars.

The subject of this invention is an apparatus for dyeing, bleaching, mordanting, or washing fabrics or textile materials, according to which the two methods of treatment mentioned above are combined. For this purpose a winding-frame is used, one or both ends of which are formed by hollow members, the interior of which communicate with likewise hollow trunnions, and between the two end members removable perforated pipes parallel to the axis of the trunnions. The pipes communicate with one or both of the end members and hollow trunnions, and over them the fabric to be treated is spirally wound from within outward.

By means of this apparatus the fabric can be treated much more effectively than has hitherto been the case, as each individual coil of material is thoroughly acted upon on both sides

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by the liquid rushing out at a high pressure through the holes of the pipes, and as the fabric in consequence of the rotation of the frame is also perfectly exposed to the liquid in the vat, which is thoroughly mixed up by reason of the continuous flow from the pipes. The period necessary for treatment will also be greatly reduced as compared with the ordinary methods of dyeing, and goods of any quality can be equally well and rapidly treated, as during the process they are perfectly protected from all injurious influences.

The apparatus also presents the advantage that by employing a closed vat it can be used in drying the textile materials in rarefied air.

APPARATUS FOR MERCERIZING.

Tom Pratt, of Shipley, England. Patent No. 750,694, dated January 26, 1904.

This invention relates to improvements in apparatus for mercerizing cotton yarns in hank (chiefly) or other form, and is also applicable for dyeing, bleaching, drying, and otherwise treating such yarn or yarns or other fibrous material.

The novelty consists, essentially, in the employment of a reel to carry the hanks or yarn in other form, the longitudinal bars of which may be stationary or intermittently or continuously rotated, means for rotating such bars, with screw-operated or rack-operated cones or sliding wedges, and springs capable of moving the longitudinal bars of the reel inward or outward, so as to vary the tension of the yarn being treated. Means for inclosing the reel and internal parts of the apparatus hermetically during a portion or the whole of any process the hanks may be required to be subjected to are provided. For adjusting the inclosing medium with relation to the reel, and for controlling the inlet to the inclosing chamber and the outlet therefrom of any liquid or fluid which may be necessary to be employed in the

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treatment of the hanks or yarn during any of the processes suitable means are used.

GAME-BALL-DYEING APPARATUS.

Alonzo L. Burt, of Bridgeport, Conn., assignor to the Burt Company, of Hackensack, N. J. Patent No. 751,145, dated February 2, 1904.

The invention consists in an apparatus comprising a set of protecting members which are so clamped to the ball as to exclude the dye from the spots and all other parts of the ball's surface which are not to be colored, while leaving the surface for a single or a plurality of stripes or other pattern exposed to the dye, so that the dyeing may be completed at a single operation. The stripes or dyed portions may be of any desired pattern, and the outline of the spots may be circular or otherwise, as desired.

YARN-DYEING MACHINE.

Robert Elliott, of Olney, Pa., assignor of one-half to William B. Keefer, of Philadelphia, Pa. Patent No. 751,154, dated February 2, 1904.

This invention describes a machine for dyeing yarn and the like, and in such connection it relates to the construction and arrangement of parts constituting such a machine.

The object of the invention is to provide a machine of simple construction whereby yarns or the like may be quickly and advantageously dyed. It consists of a vat for the reception of the dye liquor, two horizontal frames connected together in parallel relationship by links and cross-rods on each frame to carry the skeins of yarn, in combination with means for reciprocating the connected frames in the vat, whereby when one frame and its cross-rods travel in one direction the other frame with its cross-rods travel in an opposite direction in the dye liquor.

The claims cover the details of construction.

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APPARATUS FOR DYEING, ETC.

Paul Schirp, of Barmen, Germany. Patent No. 755,050, dated March 22, 1904.

This invention relates to improvements in the apparatus for dyeing, bleaching, treating with mordants, washing, and the like textile materials, described in U. S. Patent No. 700,832. It has been found that for turning the tub of said apparatus in the basin this latter must be rather of considerable size. This hinders the filling and emptying of the tub, and evaporation and cooling of the heated coloring liquor takes place on account of the large uncovered surface of the vat. These drawbacks have been avoided in the present improved construction, and this has been attained by making one or two of the side walls of the vat so that they can be taken off or turned down or sideways, and by placing the tub on rollers so that it can be rolled in or out of the vat when the respective side wall has been taken off or laid down. The tub is then carried between a suitable lifting-tackle, two hydraulic winches or crab-winches or their equivalent, where it is raised and then turned. By this means the vat can be made so small that there is hardly any dead space in it when the tub has been placed therein, and the vat can be made so high that the coloring liquid will cover the tub and its contents completely and the evaporation of said liquid is reduced to a minimum.

DRYING-CYLINDER FOR TEXTILE MACHINERY.

Charles C. Butterworth, of Philadelphia, Pa., assignor to H. W. Butterworth & Sons Company, a corporation of Pennsylvania. Patent No. 755,354, dated March 22, 1904.

This invention has for its object the withdrawal of the water of condensation from the drying-cylinder during its operation or when at rest, the operation taking place equally well under both conditions.

In carrying out the invention, the cylinder is provided on the inside with a hollow discharge-bearing arranged centrally in one

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of the cylinder-heads and combined therewith is a downwardly hanging discharge-pipe, the upper end of which is loosely journaled upon the hollow discharge-bearing and the lower end opening into the cylinder close to the bottom thereof. The steam admitted to the cylinder at one end forces the water of condensation upward through the depending discharge-pipe and out through the hollow bearing.

APPARATUS FOR DYEING.

James A. Willard, of Chattanooga, Tenn., assignor to Vacuum Dyeing Machine Company. Patent No. 755,422, dated March 22, 1904.

This invention relates to certain new and useful improvements in apparatus for dyeing raw stock, wool, and similar material.

The object of the invention is to dye, wash, and fix the dyestuffs upon the material being operated on while it is submerged at all times without coming in contact with the air and until the color has been set and made fast or permanent.

The invention further aims to construct an apparatus of this character which is so constructed and arranged that after the material has been operated upon it can be readily removed from the apparatus and transported to any point desired.

The invention further aims to construct an apparatus for dyeing raw stock, wool, and similar material which is so constructed that after the material has been compressed to be operated upon it will be securely held in its compressed condition.

The claims cover the details of construction.

MERCERIZING APPARATUS.

Robert P. Smith and George E. Drum, of Philadelphia, Pa. Patent No. 755,716, dated March 29, 1904.

This patent describes a complex construction of a machine intended for use in mercerizing yarn. The claims cover the details.

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MACHINE FOR DYEING TEXTILE FABRICS.

Charles Loxton Rothwell-Jackson and Edward Wilson Hunt, of Bolton, England. Patent No. 757,055, dated April 12, 1904.

This invention relates to improvements in machines for chemicking, scouring, bleaching, dyeing, mercerizing, washing, or similarly treating textile fabrics in the open state; and the object is to enable the goods to be saturated with the liquor more rapidly and more effectively than is possible with existing machines.

In carrying the improvements into effect an open washing-machine is used in which are mounted a pair of driven batch-rollers and reversing-gear and an intermediate self-adjusting drum lying in constant contact with the cloth on both batch-rollers, and the cloth is wound off one batch-roller and onto the other and then the driving mechanism is reversed and the cloth is wound back again, as described in the specification of Patent No. 666,056.

The improvements consist in the combination, with the driven batch-rollers and the self-adjusting drum, of an arrangement of spurt-pipes and presser or squeezing and spreading roller for distributing the liquor on the cloth as it passes over the self-adjusting drum on its way from one batch-roller to the other.

APPARATUS FOR OXIDIZING AND DRYING TEXTILE MATERIAL.

John W. Fries, of Winston-Salem, N. C. Patent No. 757,104, dated April 12, 1904.

This machine consists of a suitable closed chamber provided with steam coils, pipes, or cells, into which steam at high pressure is passed to secure a high degree of radiant heat. It is provided with transverse guide-rollers at top and bottom, about which the yarn or textile material is guided, so as to move up and down many times within the chamber before it emerges, and thereby be retained within the chamber in position to be acted upon by the radiant heat of the steam-coils until it becomes substantially dry, the said drying process being carried on in

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a bath of steam which fills the chamber. The yarn or textile material is fed into the chamber through an aperture near its bottom, and likewise it is withdrawn through an aperture near the bottom, so that no steam can escape from the upper or effective part of the chamber.

The textile material, whether yarn or woven fabric, and when properly dyed, is caused to pass through an atmosphere of steam while being subjected to a high temperature of radiant heat, which has the effect of expelling the excess of moisture in the dye solution contained in the material under treatment while drying out the material under high temperature in a bath of steam. The compartment in which this process is carried on is kept supplied with steam provided by vaporizing the moisture carried in with the textile material. Consequently after first filling the chamber or compartment with steam no further supply of steam is necessary, the same being insured by the employment of the high-temperature radiant heat used to properly develop, brighten, and fix the color.

AUTOMATIC DYEING APPARATUS.

James Marshall, of Fall River, Mass. Patent No. 757,478, dated April 19, 1904.

This invention relates to improvements in dyeing-vats holding a quantity of dye liquor in which the materials to be dyed are placed and generally stirred with a fork or pole by an attendant, the process requiring open vats from which the steam and dye fumes are obnoxiously escaping, and which is dependent for uniform penetration and admixture of the dye upon the skill and faithfulness of the attendant.

The object of the invention is not only to do away with the attendant, but to perform the operation in a much more thorough and uniform manner without damage to the materials and in a closed vat from which the steam and fumes may be led away through a flue: also, to keep the various lots of similar materials

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being treated for the same color separate, as is often desirable, and now requires separate operations.

The claims cover the details of construction.

STEAMING AND DRYING MACHINE FOR TEXTILE FABRICS.

John William Fries, of Winston-Salem, N. C. Patent No. 759,980, dated May 17, 1904.

The object of this invention is to provide a construction of steaming and drying machine in which the fabric shall at all times travel upon the guides and cylinders with one of its faces alone in contact, so that the other face shall not be crushed or subjected to direct pressure. This is important in the treatment of such fabrics as velvets, plushes, and corduroys, in which it is desired that no pressure shall come upon the pile. It is also useful in the treatment of other goods where the finish upon the back and front is different.

The design of the machine is also to apply moisture to the fabric, which is vaporized into steam by heat of a suitably constructed steaming-box and the fabric treated and subsequently dried, the said steps being taken in succession and so that the fabric receives such treatment in a continuous manner.

In carrying out the invention the textile web, after being dyed or treated in any suitable manner, is guided through a steaming-box provided with steam-heated cylinders and guides in such a manner that one face only of the web is brought into contact with said cylinders and guides. The box is further provided with a diagonal guide about which the web is guided and caused to pass laterally from the box and be received upon a similar diagonal guide, whereby it is again caused to travel in a similar direction to that first assumed. The web is then guided over a series of drying-cylinders and guides, still maintaining the same face in contact with the said cylinders and guides that was in contact with the cylinders and guides in the steaming-box.

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MACHINE FOR DYEING.

Charles W. Herbine and Henry Reeh, of Reading, Pa. Patent No. 760,118, dated May 17, 1904.

This invention relates to improvements in dyeing-machines; and the object is to provide a machine adapted particularly for dyeing hosiery and yarn in which the product is constantly revolved with immersion in the dye liquor, and from which it may be easily removed in bulk.

The invention consists of a removable revolving perforated cylinder suitably mounted in a tank and means for transmitting rotary motion to said cylinder.

APPARATUS FOR DYEING, ETC.

Jean Schmitt, of Danjoutin-Belfort, France. Patent No. 764,825, dated July 12, 1904.

This invention relates to an improved apparatus for dyeing, mordanting, bleaching, or otherwise treating textile rovings and slubbings with circulating liquids.

The slubbings or rovings are wound upon perforated tubes which are stopped at one end and mounted by their other open end in the upper plate of a closed chamber which may be immersed with its tubes in a vat containing the dyeing, bleaching, mordanting, or other bath, and may be connected to a device for imparting a circulation to the said bath through the textile material wound upon the hollow perforated tubes. On the part of the said hollow perforated tubes comprised between the bases of the coned parts of the rovings or slubbings the perforations are made at equal distances apart, while on the parts of the said tubes extending from the said bases to the apices of the terminal cones of the rovings or slubbings these perforations are made step by step smaller in proportion as the textile layers diminish in thickness.

The claims cover the details of construction.

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APPARATUS FOR DYEING.

Otto Venter, of Chemnitz, Germany. Patent No. 764,966, dated July 12, 1904.

The present invention relates to an apparatus for dyeing loose material, fabrics, hosiery, and the like or for corroding, bleaching, etc., the same which renders it possible to use the expensive means—compressed air and vacuum—only at the commencement of the dyeing process, while the material to be dyed is observed in an open dye-vat. During the further process, however, the bath is driven through the material by means of a pump with optional speed in alternately opposite directions. By the action of two three-way cocks a further advantage is gained, as it is only necessary to set the pump, in the present case a rotary pump, running in one direction only, for the purpose of attaining an alternate circulation of the bath. The dye-vat, which is open at its top, may naturally have any optional position in regard to the dyeing-bath reservoir. It may, for example, be arranged above or below it or in a line with it.

The claims cover the details of construction.

MACHINE FOR DYEING SKINS.

Pierre Bruffaers, of Schaerbeek, Belgium, assignor of one-half to Henry M. Peyser, of Boston, Mass. Patent No. 765,375, dated July 19, 1904.

The claim describes a machine for dyeing skins, the combination of the frame, a rotary drive-shaft arranged therein, fast and loose pulleys arranged on said shaft, a belt-shifting slide-rod arranged in operative proximity to said pulleys, the same having a notch therein, means for normally holding said slide-rod at one of its limits of movement, a pivoted catch engageable with said notch, holders on which the skins are maintained extended, means for transmitting power from the drive-shaft to said holders whereby to rotate the holders, means for discharging the dyeing materials onto the skins while so held, and means, actuated from the drive-

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shaft, for automatically moving said catch and thereby releasing said slide-rod.

APPARATUS FOR MERCERIZING.

Isaac E. Palmer, of Middletown, Conn. Patent No. 765,398, dated July 19, 1904.

This invention relates to an improvement in apparatus for mercerizing yarn, and more particularly to the frame for stretching and moving the yarn during its dipping process.

The object of the invention is to provide a frame which will stretch the yarn on the inside of the skein as well as on the outside thereof, so as to obtain a more even stretching of the yarn than in the frames heretofore in use, in which the outside of the skein has been stretched to a greater degree than the inside owing to the outside of the skein being farther from the reel than the inside of the skein.

The claims cover the details of construction.

DYEING APPARATUS.

Stuart W. Cramer, of Charlotte, N. C. Patent No. 765,883, dated July 26, 1904.

This machine consists of a tank or other receptacle in which the material is treated. This has a perforated cover which is secured by clamps or other suitable device. It also has a circulating supply pipe with a pump through which the dye-liquor is supplied evenly in the vat under the false bottom. The perforated false bottom is provided with means for raising and lowering it in the tank.

In the operation of this machine the material to be dyed is placed upon the false bottom, the cover lowered into position in the tank and secured by the clamps, when the bottom is raised to compress the material between the cover and the bottom to the density found most desirable to secure the best results of the dye-liquor in passing through the material. The pump is then

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put into operation and the dye-liquor forced through the material. After the dyeing has been completed the liquor in the tank is returned to its source of supply. The bottom is elevated to express the liquor from the dyed material, and then the cover is released and raised, when the bottom is further elevated to raise the material thereon to the upper end of the tank, so that it may be moved bodily to any suitable means for further treatment.

RINSING-MACHINE.

Isaac E. Palmer, of Middletown, Conn. Patent No. 766,464, dated August 2, 1904.

This invention relates to a rinsing-machine, and more particularly to a machine for rinsing yarn or fabric in a rope form, with the object in view of agitating the rope of yarn or fabric while in the bath and alternately permitting it to work loosely over rollers, while preventing the parts of warp which come in contact with the rollers from becoming unduly stretched.

The claims cover the details of construction.

MACHINE FOR EXTRACTING LIQUID FROM FABRIC.

Isaac E. Palmer, of Middletown, Conn. Patent No. 766,517, dated August 2, 1904.

This invention relates to a machine for extracting liquid from fabric, and more particularly to means for utilizing centrifugal force in connection with the wringing of a rope of fabric to free the fabric from liquid.

In this machine the rope of fabric is fed to the centrifugal frame from a series of gripping-rollers, three in number, mounted in a suitable frame, and is drawn from the centrifugal frame by a corresponding set of gripping-rollers at the opposite end of the bed. The fabric after passing between the inlet-rollers in the form of a flat strip passes through hollow trunnions and thence under and partially around the roller in one end of a vibrating

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frame, thence between two rollers up, over, and around the first roller and down between the sides of the vibrating frame under and around another roller, thence between two more rollers and over and partially around the last roller, and thence through the hollow trunnion to the discharge-rollers.

The centrifugal frame, driven at a high speed of rotation while the rope of fabric is being drawn through, produces a tight twist and wringing effect upon the rope of fabric in proximity to the rollers at the inlet end and throughout that portion of the rope of fabric between the inlet-rollers and the centrifugal frame, and this twist is taken out as the rope of fabric leaves the centrifugal frame and passes through the hollow trunnion to the discharge-rollers.

The rope of fabric in passing through the centrifugal frame is carried a considerable distance radially away from the axis of rotation of the centrifugal frame in opposite directions from the axis, and so is brought under the influence of a powerful centrifugal force because of the high rotation of the centrifugal frame, which has a tendency to throw the liquid away from the rope of fabric and remove all free liquid from the fabric. This centrifugal action follows closely upon the wringing effect produced by the twist of the fabric as it approaches the centrifugal frame, so that all liquid which is wrung to the surface will be thrown off.

MACHINE FOR DYEING AND WASHING.

César Corron, of Lyons, France. Patent No. 768,425, dated August 23, 1904.

In machines at present used in dyeing, washing, mordanting, soaping, and otherwise treating textile materials the actions of steeping and dashing are effected by a continuous motion. It is found, however, that it is advantageous to produce these actions in an alternating manner under differing conditions. For this purpose the movements to which the material is subjected are

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divided in the following manner: first, into a number of only partial rotations of the material in order to admit of a steeping action; second, into a similar number or approximately similar number of virtually horizontal reciprocatory movements of the material without rotation for producing a dashing action. The dashing is the ancient operation which the working dyer produced by hand when he individually washed each hank of silk in a washing-trough, and it is this operation which best divides and separates the threads of silk in the liquids, and it is the best and most active of the operations for dyeing, washing, and soaping when combined with a rotation of the material for giving the steeping or rinsing action. This double movement is obtained according to this invention by means of a wheel having a wavy groove or guide forming a cam, which imparts such movements alternately and automatically to the means for operating the skein-carriers as will cause them to produce successively the double action as above described.

The claims cover the details of construction.

APPARATUS FOR MERCERIZING YARN.

Isaac E. Palmer, of Middletown, Conn. Patent No. 770,920, dated September 27, 1904.

This invention relates to apparatus for mercerizing yarn, and more particularly to the frame for stretching and moving yarn during its dipping process and for supporting and conveying the stretching-frame.

The claims cover the details of construction.

APPARATUS FOR DYEING COPS, ETC.

Romulus Rawson and Edward Lodge, of Huddersfield, England. Patent No. 772,581, dated October 18, 1904.

The object of this invention is to dye, scour, or bleach yarn in the cop or cheese instead of in the hank, and to subject the whole yarn mass from centre to circumference of the cop or cheese to

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the action of the liquor, whereby the process of reeling the yarn for dyeing purposes is obviated.

The machine consists of a frame or frames having a series of parallel bars of suitable size spaced apart to form recesses between each bar, to receive the cops, which fit closely therein, adjustable blocks to hold and support the ends of the adjacent rows of the cops and fill in the spaces between said cops, and a pump for causing the liquor or liquid to circulate through the frame.

APPARATUS FOR DYEING UNDER PRESSURE.

Léon Détré, of Reims, France. Patent No. 773,378, dated October 25, 1904.

This invention relates to an apparatus for dyeing under pressure yarns wound up in the form of bobbins, and has for its object to dye regularly without great expense of manual labor and with a great rapidity the yarns with the most delicate shades.

The claims cover the details of construction.

TAPESTRY-PRINTING MACHINE.

Walter P. Benham and John K. Williamson, of Philadelphia, Pa. Patent No. 773,461, dated October 25, 1904.

The object of this invention is to provide a machine by which it shall be possible to print a greater length of warp than has before been possible upon a drum of a given size, or, what is the same thing, to reduce the size of the drum necessary for the support of the warp for a given length of tapestry while the same is being printed.

It is further desired to provide a novel combination of mechanism for winding yarn upon a drum in such manner that it shall be possible to print at a single operation the yarn necessary for a piece of goods of greater length than has been conveniently done hitherto.

This machine provides means for winding one or any practical number of warps upon a drum in such manner that the

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piece or pieces of goods resulting from the same may be made of any length up to one practically double that of the circumference of the drum upon which it is wound.

APPARATUS FOR DYEING, ETC.

Otto Venter, of Chemnitz, Germany. Patent No. 774,407, dated November 8, 1904.

This invention relates to apparatus for dyeing, bleaching, or otherwise treating materials; and its object is to subject such material to a partial sucking or forcing action after the dyeing or bleaching process. In such apparatus, especially when loose material, fabrics, hosiery, and the like are treated, it has been found indispensable to subject the latter to as complete withdrawal of the air as will be possible or to treatment with hot gases or vapor. Such withdrawal of air, however, is impracticable when the whole mass of material is simultaneously subjected to the vacuum available, or when the hot gases or vapor are simultaneously forced through the whole mass; but in the present invention the vacuum-chamber is formed as a cylindrical hollow body or piston and is moved along through a pipe upon which the material is held, both said piston and pipe being perforated to allow for the suction or for the discharge of the hot gases or vapor.

CALENDER-ROLL.

Emil Rudolf Beck, of Hilbersdorf, Germany. Patent No. 775,438, dated November 22, 1904.

Calender-rolls which are made of separate and crosswise-superposed disks obtained from cotton fibres have the advantage of being smoother and more even on the cylindrical surfaces; but nevertheless they are not uniform enough for very fine goods, because they show the single layers upon the goods.

This new-process calender-rolls are made from the fleece obtained by the carding-engine, and in such fleece the fibres are crossing each other. To accomplish this effect, use two engines,

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which are placed at an angle to each other. These engines produce together a fleece having layers lying in directions at an angle to each other, preferably a right angle. The fibres in the fleece produced by both carding-engines are deposited in different directions—that is, crosswise to each other. From this fleece disks are cut and a roll formed of such disks, placed side by side upon a central shaft or bar, and pressed closely together by heads at the opposite ends of such bars in the usual or any suitable manner. When pressed together upon the roll, the dividing lines between the individual disks will not be discernible. The fibres of the several disks lie in many different directions and being crossed in each individual disk, so that in the completed roller the fibres are crossed at as many points as there are disks used in making the rolls.

VOMITING-KEIR.

Eugene D. Jefferson, of Lowell, Mass. Patent No. 775,450, dated November 22, 1904.

The object of the invention is to reorganize and improve vomiting-keirs, particularly the vomiting-keir of Patent No. 612,874.

To avoid the objectionable result of the above patent, the present invention contemplates the use, in connection with a keir and a vomiting-pipe connecting the bottom and the top thereof, of automatic means operating intermittently to raise to the top of the keir the liquor which has percolated to the bottom of the keir through the fabric therein, the said means operating independently of the pressure or the temperature of the contents of the keir, so that the temperature may be maintained constantly at the most favorable point, irrespective of the operation of the means for moving the liquor.

Another feature of the invention consists in the use of automatic controlling means for controlling the action of the liquor-raising means operating upon the accumulation of a sufficient quantity of liquor to set the liquor-raising means in operation

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and to cause the operation thereof to cease when the liquor has been raised.

APPARATUS FOR DYEING, ETC.

Arnold Fankhauser and Adolf Ryser, of Baden, Switzerland, and Friedrich Johann Baptist Knibiehler, of Lörrach, Germany, assignors to the firm of Wegmann & Co. Patent No. 775,621, dated November 22, 1904.

The dyeing of cotton has hitherto been usually effected in the roving from the coarse flier or in the cotton flocks. The dyeing of the roving from the coarse flier has the drawback that the dyeing of the final product when the roving is finished is not absolutely uniform. The dyeing of cotton flocks has the drawback of causing great waste.

This invention relates to an apparatus for dyeing cotton and the like in which the sliver is dyed by means of perforated sockets or holders, whereby the above-mentioned drawbacks are removed.

The claims cover the details of construction.

DRIER.

Thomas Andrews and Simon J. Loewenthal, of Rockaway, N. J. Patent No. 775,717, dated November 22, 1904.

This invention relates to improvements in driers particularly designed for drying fabrics and of that class having a series of rotary cylinders through which the heating medium, such as steam, is designed to pass. In certain machines of this character the several cylinders are rotated through gear connections one with another, and therefore, owing to the friction, a very great power and consequent large amount of motive agent is required to operate the machine. Further, in the class of machines above referred to the several cylinders must be filled with steam, which results in waste by employing more steam than is necessary for drying purposes.

The object of this invention is to obviate the above-mentioned

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objections by providing a drier in which each cylinder is rotated independently with a comparatively small amount of motive agent by means of a steam turbine in one end of the cylinder and using the motive agent as a heating medium, thus resulting in an economical use of steam.

In the operation the material to be dried is to be passed over the cylinders in a zigzag fashion, and the steam admitted to the several cylinders will act on the turbines thereof and impart rotary motion, and then the steam will pass between the inner and outer shells to the exhaust, and therefore it will be seen that a comparatively small amount of steam will be required to perform the desired service.

APPARATUS FOR DYEING.

Joe Kershaw, of Bradford, England. Patent No. 776,069, dated November 29, 1904.

This invention relates to improvements in machines or apparatus for dyeing, mordanting, or similarly treating with liquids wool, slubbing, yarn, and other fibrous material.

The claim is for an apparatus for dyeing and the like comprising a containing vessel, a reticulated cover, a reticulated false bottom to hold the material, means for giving said bottom a continuous rising-and-falling movement so as to alternately increase and relax the pressure on the material, a passage extending from below the false bottom to above the cover, a deflector above said passage, and a steam-jet in the passage.

DYEING-MACHINE.

John R. Greenwood, of Boothwyn, Pa. Patent No. 776,237, dated November 29, 1904.

This invention relates to mechanism for dyeing wherein the material to be dyed is continuously submerged within the dye without exposure to the atmosphere during the dyeing process. Heretofore the material had to be passed several times through

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the machine, and at each removal for another passage the material was for an extended time exposed to the atmosphere, which is very injurious to the process. In this machine the mechanism is supported upon a framework removably inserted in the vat and passes the material through the machine in return and continuously repeated courses while immersed in the dye until the requisite color or shade is obtained, with a saving of time, labor in handling, and with uniform excellence in results. The construction of the machine while capable of continuing the material within the dye throughout the process, except for a very limited time, occupies no more space than the previous machines and can readily be installed in the same position, which is a decided advantage for plants already established.

The claims cover the details of construction.

DYEING-MACHINE.

Joseph Hussong, of Camden, N. J. Patent No. 776,327, dated November 29, 1904.

The object of the invention is to improve the construction of the frames on which are suspended the hanks of yarn to be dyed in a dyeing-machine, so that the sticks can be readily turned.

This invention is used in connection with a dye-vat, covered by Patent No. 671,799; but it will be understood that the invention can be used in connection with any suitable dye-vat.

The claims cover the details of construction.

CENTRIFUGAL MACHINE FOR DYEING.

Bernhard Cohnen, of Grevenbroich, Germany. Patent No. 776,295, dated November 29, 1904.

The object of this invention is to enable materials, particularly textile materials, to be boiled, treated with mordants, dyed, washed, etc., in the same machine without its being necessary, as at present, to remove the materials at each stage of the treatment from the apparatus in which they have been treated in order to

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place them in the centrifugal machine and remove them from there again into the apparatus in which they are treated. On the contrary, the machine enables the centrifugalizing to be effected in the one machine, if necessary, and, according to the state of treatment, without the necessity of shifting the materials to be treated.

The claims cover:

1. In a centrifugal machine for treating textile materials, the combination of a closed centrifugal drum, a series of compartments arranged within the said drum and in communication with each other, means connecting the first of said series of compartments with a pump for forcing dye-liquid thereto, and means connecting the last of said series of compartments with said pump, whereby the liquid is returned thereto after passing through said compartments.

2. In a machine of the type set forth, the combination of a closed centrifugal drum, a series of concentrically disposed chambers arranged within the said drum, said chambers being in communication with each other, the interior one being connected with a pump for supplying liquid to the same, the central chamber being provided with perforated sides and adapted to receive the material, and the outer chamber forming a second liquid-compartment, and means connecting the last-named chamber with said pumps for returning the liquid thereto.

MACHINE FOR DYEING, ETC.

John W. Fries, of Winston-Salem, N. C. Patent No. 778,236, dated December 27, 1904.

This invention refers to machines for treating yarn.

The object is to provide a construction of machine which shall occupy small space and have capacity for successive immersions and repeated squeezing during the treatment to insure full and uniform impregnation of the dye or other liquor preliminary to the subsequent drying operations with or without steaming.

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It is especially useful in dyeing yarns with indigo, which is soluble in alkaline solutions and which requires repeated dippings and squeezings to secure the proper body of coloring-matter. In the subsequent treatment the soluble indigo is oxidized by exposure to the atmosphere and rendered insoluble by loss of hydrogen.

The invention comprehends a vat provided above the liquid-level with a rotating cylindrical roller and below the liquid-level within the vat a series of grooved wheels so journalled upon a transverse shaft as to revolve in parallel vertical planes oblique to the cylindrical roller, whereby the yarn in passing alternately about the roller and grooved wheels will advance from one end of the vat toward the other end and at the same time be repeatedly dipped in or treated to the dye liquor in the vat.

The improvements also include, in combination with the above or equivalent means for treating the yarn, an elastic pressure-roller resting upon the cylindrical roller and adapted to squeeze the yarn as it passes about said cylindrical roller and suitably rotated so as to remove all retarding friction upon the yarn.

The claims cover the details of construction.



V.—MISCELLANEOUS.

PAPER AND METHOD OF MAKING SAME FOR OBTAINING FAST COPIES FROM WRITINGS OF ANILINE INKS.

Murray H. Chapin, of Bridgeport, Conn., Assignor to Wyckoff, Seamans & Benedict. Patent No. 749,684, dated January 12, 1904.

The process consists in first subjecting the tissue-paper to the action of a substance which has an affinity for the ink or coloring-matter of the type impressions, so that during the operation of press-copying, when the moisture or water dissolves the color in the ink characters, the said coloring-matter is brought into contact with the above-mentioned substance contained in the prepared paper. This contact causes said substance and the ink to immediately enter into chemical combination, and the color is at once precipitated onto the tissue sheet in the form of an insoluble compound, which is substantially proof against the further action of water. Likewise the portion of the coloring-matter which is retained by the original sheet is also rendered substantially waterproof and permanent by a similar chemical action. In other words, the paper, both tissue and original sheet, may be said to become permanently dyed by the ink instead of having a mere mechanical connection or union with the paper, as usual heretofore.

The paper may be prepared by being passed through a bath composed of four hundred parts of water to one part of tannic acid, by weight. Sal-soda or any other suitable mordant or combination of mordants in proper proportions may be used, if desired, instead of tannic acid, which latter has been thus far used successfully in practice. After the bath the paper may be properly dried and smoothed, either by passage through heated rolls or otherwise. In practice the copying-tissue may be passed

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through the mordant bath from a continuous roll and after being dried and smoothed may be cut up into sheets and formed into press copy-books in the ordinary way. The described chemical action will then take place during the press-copying operation, both in the prepared tissue and also in the original sheet.

SENSITIVE PHOTOGRAPHIC EMULSION.

Arthur Eichengrün, of Elberfeld, and Adolf Braun, of Mülhausen, Germany, assignors to Farbenfabriken of Elberfeld Co., of New York, N. Y. Patent No. 752,388, dated February 16, 1904.

It is found that such acetylied derivatives of cellulose as are soluble in alcohol—*e.g.*, the acetyl derivatives of cellulose soluble in alcohol which is described in United States Letters Patent No. 734,123, dated July 21, 1903—can be employed with great success for the preparation of new photographic emulsions sensitive to light and suitable for the manufacture of photographic plates, papers, films, or the like. The papers, for instance, coated with these emulsions possess a great brilliancy, a fine grain, and a good resistance to external influences. They are stable and will not become hard and brittle.

Instead of the above-cited cellulose acetate other acetyl derivatives of cellulose soluble in alcohol may be employed.

SOAP AND METHOD OF MAKING SAME.

George A. Schmidt, of Chicago, Ill. Patent No. 755,945, dated March 29, 1904.

The invention relates to a novel medicated soap and method of making same, the object being to produce medicated soap in which the medicaments are kept out of intimate contact with, and therefore out of the sphere of, chemical action of soap or its constituent substances.

It relates more particularly to that class of toilet soap known as "gritty"—that is, soap with which powdered or granulated pumice-stone, infusorial earth, fossil diatomes, tripoli, etc., are

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mixed, such combinations being better adapted to purify the furrows and recesses of the skin than ordinary soaps.

The novelty consists in introducing the medicaments into the pores of the gritty material and then adding the latter to the soap.

1-5-NITROANTHRAQUINONE-SULPHONIC ACID.

Robert E. Schmidt, of Elberfeld, Germany, assignor to Farbenfabriken of Elberfeld Co., of New York, N. Y. Patent No. 757,057, dated April 12, 1904.

This invention relates to the manufacture of the hitherto unknown 1-5-nitroanthraquinone-sulphonic acid.

The process for producing this body consists in treating anthraquinone-alpha-sulphonic acid (see U. S. Patent No. 743,664) with nitric acid or with other nitrating agents. The 1-5 and the 1-8 nitroanthraquinone-sulphonic acids are thus produced simultaneously, and can be readily separated from each other owing to the different degrees of their solubility or that of their salts; 1-5-nitroanthraquinone-sulphonic acid in the shape of the potassium salt forms microscopic plates of sharp outlines soluble with difficulty in cold water. It is reduced to 1-5-amidoanthraquinone-sulphonic acid when treated with reducing agents, and transformed into 1-methylamidoanthraquinone-5-sulphonic acid upon treatment with an aqueous solution of methylamine. By further heating this body with methylamine to 150° to 160° C. sym. 1-5-dimethyldiamidoanthraquinone results.

1-8-NITROANTHRAQUINONE-SULPHONIC ACID.

Robert E. Schmidt, of Elberfeld, Germany, assignor to Farbenfabriken of Elberfeld Co., of New York, N. Y. Patent No. 757,058, dated April 12, 1904.

This invention relates to the manufacture of the hitherto unknown 1-8-nitroanthraquinone-sulphonic acid.

The process for producing this body consists in treating anthra-

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quinone-alpha-sulphonic acid (see U. S. Patent No. 743,664) with nitric acid or with other nitrating agents. The 1-8 and the 1-5 nitroanthraquinone-sulphonic acids are thus produced simultaneously, which can be readily separated from each other owing to the different degrees of their solubility or that of their salts; 1-8-nitroanthraquinone-sulphonic acid in the shape of the potassium salt forms microscopic needles soluble with difficulty in cold water. It is changed into 1-8-amidoanthraquinone-sulphonic acid when treated with reducing agents, and reduced to 1-methyl-amidoanthraquinone-S-sulphonic acid upon treatment with an aqueous solution of methylamine. By further heating this body with methylamine to 150° to 160° C. sym. 1-8-dimethyldiamidoanthraquinone results.

PIGMENT AND METHOD OF PRODUCING IT FROM FERROUS LIQUORS.

Alexander S. Ramage, of Cleveland, Ohio. Patent No. 758,687, dated May 3, 1904.

U. S. Patent No. 691,324, granted January 14, 1902, describes a light yellow basic ferric oxide and a method of producing it from ferrous liquors. The pigment of this patent is characterized by its unusual capacity for absorbing oil, which is three times as great as that of ochres. While this property is one which gives the pigment unusual value for many purposes, a pigment is frequently required with a lower absorptive power for oil, especially in the manufacture of paste goods. The present invention is concerned with the production of a pigment similar in color and other valuable properties to that of the previous patent, but having an oil-absorptive power which is lower and which can be regulated as desired by suitably varying the conditions of manufacture.

It specifically relates to the production of a composite pigment consisting of particles of the yellow basic sulphate of low oil-absorptive power mixed, impregnated, or coated with the basic

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hydrate of high oil-absorptive power, the proportion of the sulphate and hydrate being variable and dependent on the amount of oil which it is desirable that the finished product should absorb.

DETERGENT COMPOUND.

Judson K. Heikes, of St. Louis, Mo. Patent No. 759,103, dated May 3, 1904.

This compound is to be used for cleansing and bleaching clothes, washing utensils and floors, and for all purposes requiring the use of a cheap and convenient detergent, of which the following is a specification.

It is composed of the following ingredients combined in the proportions stated, viz.: cotton-seed oil, four ounces; coal-oil, one hundred and four ounces; linseed-oil, three ounces; light lubricating oil of mineral origin, five ounces; olive-oil, two ounces; oil of sassafras, eight ounces; oleum citronella, four ounces, and one-fourth of a pound of alkanet-root. Mix thoroughly by agitation.

CHROME TANNING-BATH.

Claude A. O. Rosell, of New York, N. Y. Patent No. 759,831, dated May 10, 1904.

This invention consists, essentially, in causing a skin to take up chromic oxide directly from solutions of certain salts of chromic oxide, as will now be fully explained in the subjoined description and the appended claims.

The solutions of chromic-oxide salts which are used are thio-sulphate, commonly called hyposulphite, sulphite, and other reducing sulphur salts of chromium. These salts can be made in a number of ways, such as adding the desired acid to chromic hydrate or by decomposing chromium sulphate with a suitable salt to effect metathesis or so-called "double decomposition."

Although a great many tanning solutions prepared as above will be found to give good results, such solutions differ quite

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considerably between themselves. It may be stated that a thio-sulphate solution has been found superior to a sulphite solution, and a mixture of the thiosulphate and sulphite solution has been found superior to any other thus far tried.

In making use of any of the above solutions the skin may be introduced directly from the bate after washing, or it may be prepared in any desired way. Thus, if a skin is only partly tanned by vegetable or mineral tanning material, the tanning may be completed in any of the above baths of chromic-oxide salts.

SUBSTITUTE FOR SHELLAC.

Carl Ludwig, of Schönberg, Germany. Patent No. 760,541, dated May 24, 1904.

The product essentially consists of cheap resins soluble in alcohol, being mixed with oleic acid and saponified by boiling with alkali-hydroxide and decomposed by acid. The precipitate obtained after being washed and dried is the new product, which can substitute shellac for the purpose of polishing. Further, the work with the new product is cleaner than that with common shellac. The covering made by polishing is harder, so that it is more capable of resisting scratching. The work of polishing proceeds quicker, owing to the hardness of the covering, and the workman uses up less polishing material. The pores of smooth-planed wood do not become clogged by the new product, as happens with shellac.

ORGANIC ACID FROM BEET-ROOT MOLASSES AND PROCESS OF MAKING SAME.

Hermann Schrader, of Hönningen, Germany. Patent No. 761,412, dated May 31, 1904.

This invention relates to the organic acids to be obtained from the final beet-root molasses derived from sugar by desaccharification or by fermentation and subsequent distillation of alcohol and the process of extracting same.

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The organic acids from the vinasse form a soluble syrup-like matter the composition of which answers to the formula $C_6H_{11}NO_8$. The acid substance from the vinasse is probable betain acid, $COOH:CH_2:N(CH_2)_3OH$. It is, however, possible that the product contains compounds isomeric with the said acid. The acid is capable of reducing chromic compounds to chromous compounds and generally of reducing the higher oxides of metals to compounds containing less oxygen. It is easily soluble in water, difficultly in ether. The aqueous solution of the acid liberates hydrogen when in contact with metals, as zinc or iron, and liberates carbonic acid—viz., sulphurous acid—viz., sulphureted hydrogen—from carbonates, sulphites, sulphides. The acids are also characterized by the fact that with chloride of zinc they form a double salt which crystallizes in octagonal rectangular lamina (sheets) with cut edges. The acids have a pleasant aromatic odor and flavor, and can be used as an addition to food-stuffs and such like, or as a substitute for fruit essences and such like, or as a substitute for tartaric acid and lactic acid for dyeing and printing purposes.

DYEING COMPOSITION.

George McC. Lawton, of Worcester, Mass. Patent No. 763,616, dated June 28, 1904.

The object of my invention is to provide means for effectually preventing the black in dyed materials from running into or staining other colors or shades when the materials are left in the baths or are laid together in a wet state.

The claims cover:

1. A composition of matter consisting of bichromate of potash, oxalic acid, water, a substance containing gluten, cream of tartar, tartaric acid, bichromate of soda, bicarbonate of soda, nitrate of soda, pyroligneous acid, nitrate of iron, and sulphuric acid.

2. A composition of matter consisting of water, a substance containing gluten, cream of tartar, tartaric acid, bichromate of

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soda, bicarbonate of soda, nitrate of soda, oxalic acid, pyroligneous acid, nitrate of iron, and sulphuric acid.

ACID-PROOF COMPOSITION.

Frederick Augusta Pank, of Butte, Mont. Patent No. 763,421, dated June 28, 1904.

This invention relates to a composition of matter, the same being a kind of waterproof and acid-proof paint.

This composition or paint when applied to iron pipes used in the copper-mining industry will prevent the corrosion of such pipes by the acids normally contained in the copper water. It has heretofore been necessary to line such pipes with wood; but the expensive and cumbersome lining of wood may be dispensed with if the pipes have been properly coated with this composition.

This compound consists of various ingredients in the following properties: one gallon linseed-oil, eight ounces india-rubber, four ounces resin, ten ounces beeswax, three pounds silica, two pounds red lead, and three pounds of gypsum.

WATERPROOF LEATHER DRESSING AND PRESERVATIVE.

Anton Aagaard, of Everett, Washington. Patent No. 764,971, dated July 12, 1904.

This invention relates to improvements in waterproof leather dressing and preservative, admirably adapted to preserve and render soft, pliable, and waterproof the leather to which it is applied.

In manufacturing the new composition tar made from the roots of pine trees, preferably the so-called "Stockholm" or "Norwegian" tar, dogfish-oil (*Squalus suckleyi*), and turpentine are used in the following proportions: five parts pine-root tar, fourteen parts dogfish-oil, one part turpentine. These are mixed well

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together and boiled, as follows: If the dogfish-oil has been procured by "trying out" the livers by heat, then the compound need be boiled but from fifteen to twenty-five minutes. If the dogfish-oil is "raw"—that is, oil drawn from the livers without heat—then the whole mixture must be boiled from thirty to forty-five minutes. The duration of the boiling period is material, as if the mixture is boiled for a less time than is required there will not be a thorough mixture of the ingredients, whereas if boiled for too long a period of time the mixture will become hard and brittle and of little value as a leather-dressing, and the exact time of boiling must be determined by the results thereby obtained, as determined by the tests.

APPARATUS FOR MAKING SULPHURIC ACID.

Herman Hegeler and Nicholas L. Heinz, of Lasalle, Ill. Patent No. 765,834, dated July 26, 1904.

The invention relates to sulphuric-acid-making apparatus in which a Glover or filled tower is employed in conjunction with a sulphur-burner and one or more acid-chambers; and the object is to provide means for carrying out an improvement in that part of the process worked out in the Glover tower whereby the oxidation of the sulphurous gases from the burner is caused to occur in the Glover tower to an increased extent over the previous process and without increased heat affects all in the manner set forth in the application for United States Letters Patent, Serial No. 108,908, filed May 26, 1902, entitled "Improvement in processes for making sulphuric acid."

STEARAMID MORDANT.

Armand Muller-Jacobs, of Richmond Hill, N. Y. Patent No. 767,114, dated August 9, 1904.

The inventor claims that if stearamid is dissolved in appro-

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appropriate proportions in either soap or turkey-red-oil solutions and aniline colors of either basic or acid character are added to it a liquid is obtained which when applied to cotton, silk, wool, or other fabrics through a padding-machine or by other appropriate means or by printing upon it in the ordinary way the colors can be fixed upon them uniformly and lastingly by steaming or passing the same through hot calenders in both cases at a temperature of 105° to 110° C. At this temperature the stearamid melts and fixes mechanically the colors, thereby making it possible to dye mixed goods—such, for instance, as silk and cotton—in one operation without showing any difference in shade of either of the fibres. At the same time it imparts to the goods a certain gloss and finish which is an especial requisite for many of the articles.

In some cases a passage through a weak bath of a mineral or organic acid or through a weak bath of a soluble metal salt—as, for instance, sulphate of alumina—may replace the heating, steaming, or calendering and besides may be considerably useful in fastening the colors.

Paper, wood, leather, and all other fibrous materials requiring high gloss and sizing can be treated in the same way.

DENITRATING PLANT.

Robert Evers, of Förde, Germany. Patent No. 767,335, dated August 9, 1904.

The subject of this invention is a plant for denitrating the acids and condensing and cooling the acid gases. Within the towers no loose packing material (simply shot in one piece on the top of the other) is employed, but special mixing apparatus is provided. The towers are divided into superposed chambers of appropriate height, in which instead of the packing material ordinarily used centrifugal apparatuses are located, whereby an intimate mingling of the gases and of the mixed acids with the

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gases is effected. The apparatuses are set in rotation by the gases flowing through or by special liquids, so that the gases or the liquids and the gases to be mixed are continually being thrown against each other. The tension of the gases flowing through is by this arrangement nullified, since it is utilized to perform work—viz., to rotate the apparatus. By the division of the tower into superposed chambers the gases passing through change their velocity in the various chambers and are caused to be compressed or thrown together and subsequently to expand again. By this means the speed of the gases can be regulated at will.

Another feature of the present improved denitrating plant is that in the pipes employed for condensing and cooling the gases in place of the usual filling, such as plates or the like, groups of pipes are provided, whereby the gases which flow through become intimately mingled, while at the same time a large cooling-surface is presented. These filling devices consist of a group of two sets of pipes egg-shaped and connected together. By this arrangement of groups of pipes the gases are caused to frequently alter their straight-line direction of flow and are, on the one hand, partly thrown or whirled together, and, on the other hand, partly deviated towards the cooling-walls. They present to the gases a very large surface for condensation.

The claims cover the details of construction.

SULPHURIC-ACID PLANT.

Adolf Zanner, of Brussels, Belgium. Patent No. 768,108, dated August 23, 1904.

The present invention relates to the establishment of a plant for the manufacture of sulphuric acid wherein the sulphur burning or roasting furnace is connected to the Glover tower through the intermediacy of conveying-flues of such capacity and arrangement as to receive an appropriate number of concentrating

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vessels or receptacles, so that the waste heat of the gases from the roasting-furnace may be utilized to effect the further concentration of the sulphuric acid recovered from the Glover tower while at the same time correspondingly reducing the temperature of the gases, so that the presence of the concentrating vessels will afford a means for establishing or regulating the temperature with which the gases enter the base of the Glover tower.

DYEING COMPOSITION.

George McClellan Lawton, of Worcester, Mass. Patent No. 768,809, dated August 30, 1904.

This invention seeks to provide means for effectually preventing the black in dyed materials from running into or staining other colors or shades when the materials are left in the baths or are laid together in a wet state.

In carrying out the invention the ordinary well-known process of dyeing is followed with the exception that a peculiar acid is added to the mordant and a peculiar developer and a peculiar fastener or mordant to the finishing-bath.

The finishing-bath employed is composed of chip or extract of logwood, other dyes to give the desired cast of shade, and my peculiar developer. These ingredients are varied to give the shade desired. The said finishing-bath is boiled for about one and one-half hours, and to it is added the peculiar fastener or mordant.

A novel developer incorporated in the finishing-bath is composed of bicarbonate of soda, ground sumac, ground nutgalls, ground flavin, orange or lemon, and ground fullers' earth, and the proportions which give the best results are bicarbonate of soda, ten per cent.; ground sumac, ten per cent.; ground nutgalls, ten per cent., and ground fullers' earth, sixty per cent. The said developer is in the form of a powder, and the proportions of its ingredients are varied to suit the wishes of the user.

The fastener or mordant which is added to the finishing-bath

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is a liquid, is boiled for about forty-five minutes, and is composed of water, sulphate of iron, pyrolignite of iron, and nitrate of iron combined in suitable proportions.

The claims cover the composition of the developer.

APPARATUS FOR PRODUCING PYRO-ACETIC SPIRIT.

Alois Ippendorf, of Düsseldorf, Germany. Patent No. 769,164, dated September 6, 1904.

This invention relates to an apparatus for the production of pyro-acetic spirit from sawdust.

The apparatus consists of two separate compartments, the first of which serves to preheat the wood, while in the second the pyro-acetic spirit and residual products are produced and led to the condenser.

The claim covers: In an apparatus for producing pyro-acetic acid, a cylindrical vessel having a frusto-conical end, rotatable wings within the cylindrical section of the vessel, a rotatable worm within the coniform section of the vessel, means for heating the vessel, a rotatable retort communicating with the vessel, a rotatable shaft within the retort, and inclined blades mounted upon the shaft.

ADHESIVE.

Alexander Pierce Anderson, of Bedford Park, N. Y. Patent No. 769,289, dated September 6, 1904.

This invention relates to the manufacture of a dry adhesive made by subjecting substantially pure starch to heat above the boiling-point of water under pressure and thereupon suddenly reducing or removing the pressure, such dry adhesive presenting a swelled, porous, or cellular mass in which the starch granules are all broken up or disrupted substantially throughout the mass and being soluble or emulsifiable in water.

In carrying out the process all of the varieties of commercial

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starches—that is to say, substantially pure starches—may be employed, such as wheat-starch, corn-starch, potato-starch, sago-starch, sago-flour, and tapioca-flour and arrow-root starch.

FORMALDEHYDE HYDROSULPHITES AND PROCESS OF MAKING SAME.

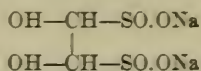
Louis Descamps, of Lille, France. Patent No. 769,593, dated September 6, 1904.

This invention relates to the manufacture of new chemical substances resulting from the action of a primary or secondary aldehyde or analogous body or of any body having simple or complex aldehydic function upon hydrosulphites. The said new substances appear to be hydrosulphite aldehydes or analogous bodies. The said bodies are obtained, for example, by causing formaldehyde to act upon an alkaline earthy or metallic hydrosulphite, whether this be in a dissolved condition, in the form of paste, or in the dry state. Such a body may be produced, for instance, from twenty parts of formaldehyde at forty per cent. and eighty parts of calcium hydrosulphite at two reducing degrees—that is to say, a hydrosulphite of such strength that two kilograms thereof is required to reduce one kilogram of pure indigotine. The combination produces chemical bodies possessing new properties, and in particular having an extraordinary stability in the dry state and at a high temperature.

In effect, the chemical body resulting, for example, from the above-mentioned action of formaldehyde upon calcium hydrosulphite can be desiccated at a temperature above 100° C. and in a current of hot air without being liable to decomposition. The bodies thus produced develop their energetic and rapid reducing and decolorizing properties under the action of moist heat, such as steaming with or without pressure. They constitute very good corrosives for the discharge of reducible coloring-matters.

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The constitution of the product obtained by this invention has not yet been ascertained with exactness or certainty; but the formula is believed to be the following:



PRODUCTION OF BINDING MEDIUMS FOR COLORS.

Carl Hermann Voigt, of Leipzig-Plagwitz, Germany, assignor to Louise Voigt. Patent No. 770,202, dated September 13, 1904.

This invention relates to improvements in the production of substances for coloring paper, cardboard, and pasteboard to be employed in printing and stamping.

These improvements consist in replacing animal glue and all other hitherto-known binding media for coloring materials by a binding medium which is produced by treating one hundred parts of starch obtained from any source, with or without an addition of mucilage, and three hundred to five hundred parts of water with from four to six per cent., by weight, of a mixture of any kind of superoxide compound and alkaline sulphate, or instead of mixing the superoxide and the alkaline sulphate before adding to the starch they might be added separately, and then the starch is first heated together with the alkaline sulphate, to which small quantities of free alkali have been previously added under pressure and at a temperature of 100° to 200° Celsius until the whole mass has become a clear solution. A quantity of superoxide of barium or strontium chemically equivalent to the alkali sulphate employed is then added. The alkali sulphate and the barium or strontium superoxide are decomposed, sulphate of barium or sulphate of strontium being formed on the one hand and peroxide of the alkali on the other hand. The last two substances being set free in the nascent state act on the mass so as to impart thereto the very highest degree of plasticity and binding capacity,

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surpassing those of the best animal glue. As glazing medium (friction medium) the substances hitherto in general use may be employed, such as soap, wax, stearine, paraffine, or the like.

For the production of the coloring material the usual colors are employed, so much of the above-mentioned binding medium being added as is sufficient to produce the desired glutinous consistency.

PAINT COMPOSITION.

William Augustus Hall, of Bellows Falls, Vt. Patent No. 771,241, dated October 4, 1904.

The new paint composition is formed by mixing about one hundred parts of the binding composition or solution just above described with about two hundred parts of what may be termed a "neutral" powdered mineral or earthy base, as whiting or talc (preferably talc), twenty-five parts of a vegetable oil, two parts potassium oxalate, and fifty parts of water, in a portion of which latter the potassium oxalate may have been previously dissolved. The vegetable oil is preferably Chinese tong-oil; good results may be secured by the use of other vegetable oils, such as linseed or cotton-seed oils.

In making the paint composition the binding composition or solution above described will first be well mixed with the talc or other neutral mineral base employed, and the Chinese tong or other vegetable oil will then be thoroughly mixed with the talc and binding composition before adding the dissolved potassium oxalate and water. The casein or other animal glutinous adhesive employed in the binder or binding composition will prevent frothing when the talc is combined with the oily composition.

APPARATUS FOR CONDENSING NITRIC ACID.

Oscar Guttman, of London, England. Patent No. 771,629, dated October 4, 1904.

This invention relates to an apparatus for condensing nitric acid, and has for its object the condensation of nitric acid from

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the gaseous into the liquid state in such manner that a liquid nitric acid is obtained comparatively free from impurities. The apparatus described is of simple construction and at the same time more efficient and durable than the condensing apparatus heretofore employed for such purpose.

It consists in the combination of the usual condensing pipes or vessels with connecting units each provided with an inlet and an outlet for the gases and an exit at the bottom for the condensed liquid and also with a common receiving-channel, the said connecting units forming a cover for the receiving-channel.

SATURATING APPARATUS FOR RECOVERING AMMONIUM SULPHATE.

Karl Zimpell, of Stettin, Germany. Patent No. 772,390, dated October 18, 1904.

This invention relates to a saturating apparatus for the recovery of sulphate of ammonia from ammonia-gases which is so constructed that the acid is constantly kept at the same degree of concentration.

The gases of ammonia are saturated with steam so that it often happens that the acid is diluted by the condensed water of said steam. This happens the more easily the greater the surfaces are over which the gases of ammonia are conducted. The condensation of steam admixed with the gases of ammonia never occurs in the first saturating apparatus, as the heat liberated from the acid by the precipitation of the ammonia from the gases is greater than the heat required for preventing the steam from condensation. In the second saturating apparatus there is, however, only a small quantity of heat liberated, which is not sufficient to prevent the condensation of the steam, wherefrom results a continuous dilution of the acid. The purpose of this invention is to prevent this condensation by means of an improved construction of the saturating apparatus.

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CELLULOSE ACETATE.

William H. Walker, of Newton, Mass. Patent No. 774,713, dated November 8, 1904.

This invention relates to improvements in cellulose acetate and other stable derivatives of cellulose, whereby the same is adapted for use as a substitute for celluloid and other pyroxylin compounds; and consists in modifying the intrinsic physical properties of cellulose acetate and other stable and non-explosive cellulose esters or derivatives thereof.

The inventor has discovered that despite the great dissimilarity which exists in many important particulars between the inflammable and explosive nitrates of cellulose and stable derivatives of cellulose, as the organic esters of cellulose, these stable compounds—as, for example, cellulose acetate—may nevertheless be readily manipulated by methods familiar to those working in plastic materials and become generally available as substitutes for celluloid when said stable compounds are combined or associated with a solvent of low volatility, such as a phenol—as, for instance, thymol, phenol, cresol, or certain essential oils containing phenolic compounds, or other organic bodies or substances having equivalent effects. The solvent should preferably be one like thymol, which melts at a temperature at which the cellulose compound is unaffected, and the action of the solvent may be promoted by the conjoint use of a volatile solvent, as chloroform, in the case just named. It is also found that the thymol or other solid solvent may be replaced wholly or in part by certain liquid solvents of low volatility.

The essential point of the invention is that the acetate or other organic ester or stable derivative of cellulose must be associated with a solvent of low volatility, as a phenol such as thymol, phenol, cresol, or certain essential oils containing phenolic compounds, or organic bodies or substances having equivalent effects. When these conditions are fulfilled, these stable cellulose derivatives as cellulose acetate become general substitutes for celluloid

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and other pyroxylin compounds for constructive purposes. They possess, moreover, under these conditions the advantage of entire safety in their manufacture and general use.

CELLULOSE ACETATE.

William H. Walker, of Newton, Mass. Patent No. 774,714. dated November 8, 1904.

This invention relates to improvements in cellulose acetate and other stable derivatives of cellulose, whereby the advantages gained by the addition of a solvent of low volatility to the cellulose derivative, as described in U. S. Patent No. 774,713, are greatly enhanced and the solvent thus employed rendered permanent or fixed.

The inventor has discovered that if to cellulose acetate or other fatty acid ester of cellulose modified by the addition of a solvent of low volatility such as phenol or cresol be added a suitable quantity of certain non-volatile substances, which in themselves are not solvents, as castor-oil, the solvent of low volatility becomes substantially fixed and is not driven off even after prolonged heating, while a solvent which in itself is not volatile, but which is not practicable on account of undue tendency to crystallize—as, for, example, acetanilide—is evenly retained in its amorphous condition in the resultant material. It is also found that when thymol or other substance having similar effect is combined with a cellulose derivative a much larger amount of a non-solvent material, such as castor-oil, may be introduced without subsequent segregation or precipitation.

APPARATUS FOR PREPARING BISULPHITE LIQUOR.

Paul Drewsen and John Parent, of Shawano, Wis., assignors to Drewsen-Parent Construction Company. Patent No. 774,869, dated November 15, 1904.

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In the manufacture of pulp, either from wood or other fibrous matter, by the sulphite process a bisulphite liquor is employed, which liquor is produced by mixing SO_2 gases with milk of lime as a base, and the means and method commonly employed for this purpose consist of a tank or tanks containing a thousand or more gallons of milk of lime, into and through which the gases are forced by some powerful means, as by strong vacuum-pumps or large centrifugal pumps, it being necessary for the proper absorption of the gases by the milk of lime to so considerably agitate or disturb the liquid (milk of lime) as to, to some extent at least, divide and separate it advisably into more or less of a spray condition in the presence of the gases. This is a very slow and consequently expensive process and is not entirely satisfactory, even as to the completeness with which the result is effected.

This invention relates to an apparatus by means of which this mixing of the gases with the milk of lime can be accomplished rapidly and successfully by comparatively simple and inexpensive means and with a less amount of force than has heretofore been employed for mixing the gases with the liquid.

APPARATUS FOR MAKING SOLUBLE STARCH.

William Browning and John James Barlow, of Accrington, England. Patent No. 773,783, dated November 1, 1904.

This invention relates to improvements in apparatus for converting starch into soluble starch and dextrine and for like operations, and is particularly applicable to the process of converting starch described in the specification of U. S. Patent No. 773,469.

The principal and essential feature of the above process lies in the treatment of ordinary starch in the form of powder with a suitable acid in the form of gas, vapor, or fine spray: and the object of our present invention is to construct an improved form of apparatus designed to simplify, expedite, and cheapen the process of conversion.

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PAINT COMPOSITION.

William A. Hall, of Bellows Falls, Vt. Patent No. 775,919, dated November 29, 1904.

The new paint composition comprises a binder or binding composition consisting of about twenty parts of animal glue or casein (preferably casein), one part ammonia, one hundred and seventy parts water, two and one-half parts formaldehyde, two parts boracic acid, and one part creosote. If glue be used instead of casein, then no ammonia or other alkali is necessary. These stated portions of the binder or binding composition may be varied somewhat, and the formaldehyde, boracic acid, and creosote may each or all be omitted, if desired, although it is better to use them. The formaldehyde has a waterproofing tendency and also a preservative effect, and the creosote acts as a preservative to prevent decomposition. The formaldehyde being acid in reaction produces a slightly-acid solution.

The new paint composition is formed by mixing about one hundred parts of the binding composition or solution just above described with about two hundred parts of a powdered mineral or earthy base, as whiting or talc (preferably talc), twenty-five parts of corn-oil extracted from Indian corn or maize, two parts potassium oxalate, and fifty parts of water, in a portion of which latter the potassium oxalate may have been previously dissolved.

APPARATUS FOR MAKING METHYL CHLORIDE.

Maurice Ernest Douane, of Paris, France. Patent No. 777,406, dated December 13, 1904.

This invention relates to apparatus for manufacturing methyl chloride by the action of hydrochloric acid on methyl alcohol. Its object is to regulate and accelerate the operation by facilitating the heating and cooling of the apparatus, which are known to be necessary, and to obtain methyl chloride quite free from acid, water, or other impurities. These results are attained in the first place by constructing the autoclave in which the two

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reacting substances are placed as an annular chamber such that the mixture can be heated or cooled in a relatively thin layer on both sides of this layer simultaneously; second, the washing vessels wherein the methyl chloride is purified after it has been produced are combined with collecting vessels which stop and collect the impurities carried by the gas.

SOLUBLE PRODUCT FROM STARCH AND PROCESS OF MAKING SAME.

Charles F. Cross, of London, England, and John Traquair, of Paisley, Scotland, assignors to the firm of William Wotherspoon, of Paisley, Scotland. Patent No. 778,173, dated December 20, 1904.

The fact has been recorded (*A Dictionary of Chemistry*, by Henry Watts, vol. v. p. 410, line 2) that glacial acetic acid heated in a sealed tube with starch converts the latter into soluble starch. This fact appears to have been overlooked and does not seem to have been again recorded in literature. In the place cited no directions for the successful application of the fact are given, nor is there any suggestion that the soluble starch produced is a different product from that obtained by other methods.

This invention relates to the manufacture of a soluble product from starch by heating with certain monocarboxylic acids, such as acetic, formic, etc.

While certain organic acids have been suggested as substitutes for mineral acids in the well-known process for hydrolyzing starch by heating it with water and a small percentage of acid or alkali, the inventors claim their process, however, is in no way concerned with the aqueous hydrolysis of starch. Indeed, it is best practiced in absence of water, although this may be present without serious injury to the process, provided there is sufficient acid present for its action to predominate over the hydrolyzing action of the water. They have found that with such acids a product can be obtained which is different from the

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soluble products from starch hitherto made, in chemical properties and in that it dissolves completely to a clear solution in boiling water, which solution does not gelatinize or separate therefrom even after some time, resists the action of ferments, and when dried yields an elastic continuous film.

MONOCHLORO-ALPHA-NAPHTHOL AND PROCESS OF MAKING SAME.

Karl Elbel, of Bierich, Germany, assignor to the firm of Kalle & Co. Patent No. 778,477, dated December 27, 1904.

This invention relates to the manufacture of a new monochloro-alpha-naphthol by acting on the alkali salts of alpha-naphthol with hypochlorites—for instance, sodium hypochlorite—in molecular proportion. The new monochloro-alpha-naphthol is precipitated from the so-obtained reaction product by means of an organic or mineral acid.

Although various monochloro-alpha-naphthols have been formerly prepared and have been described in literature, the new product differs from these in its melting-point, and is a homogeneous body containing the chlorine atom apparently in ortho position to the hydroxyl groups.

In a completely pure state it consists of white prismatic crystals, melting at 64° to 65° C., having a characteristic pungent smell and being very easily soluble in benzine, alcohol, and ether.

The new monochloro-alpha-naphthol may be combined with diazo bodies forming azo colors, and it yields indophenols when oxidized together with paradiamines or para-amidophenols.



PART IV

Notes on Processes
New Colors, etc.



Notes on Processes, New Colors, etc.

DYEING OF CHROME LEATHER.

Chrome leather, contrary to what one would expect, possesses little affinity for coal-tar coloring-matters, and for this reason it is usual to treat the leather previous to dyeing with a so-called "mordant," consisting of a solution of some vegetable tanning substance or dyewood which is easily absorbed by the leather—the effect of the treatment being to render the leather capable of fixing the artificial coloring-matter; the treatment with the tannin solution also assists to a considerable extent in the later operations of glazing and finishing.

In the choice of vegetable tanning or coloring-matters to be used for this purpose, care must be taken to only employ, wherever possible, those materials which contain but little tannin, the effect of a strong solution of tannin upon chrome leather being to reduce the stretch of the leather, to tighten the grain and render it more prominent, and if carried too far to impair the strength of the leather.

The vegetable substances most commonly employed are: Log-wood extract, which produces in weak solution a dark violet-purple shade.

Fustie Extract, which produces in weak solution a buff-yellow shade.

Hemlock extract, which produces in weak solution a slightly reddish-drab shade.

Sumāch extract, which produces in weak solution a white or very pale greenish-yellow shade.

Gambier, which produces in weak solution a brownish-yellow shade.

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Palmetto extract, which produces in weak solution a shade somewhat similar to hemlock.

Peachwood extract, which produces in weak solution a bluish-red shade.

Most other vegetable tannins and dyewoods are unsuitable, because of their little affinity for the leather. Logwood, fustic, and peachwood, on account of their containing little tannin, may be used fairly freely, but great care must be taken when employing gambier, palmetto, hemlock, and sumach, on account of these materials containing large percentages of tannin.

Many of the above materials are used in combination with one another to produce different colored bottoms, according to the color eventually required. The amount of the vegetable extract naturally varies according to results to be obtained, but should, whenever possible, not exceed more than two per cent. calculated on the drained weight of wet goods.

The tannin mordant is also applied at a temperature of about 60° C., the goods being tumbled in the solution for about twenty to thirty minutes.

The dyeing of colored chrome leather in the United States, France, and Germany is almost exclusively done with the basic colors, and the tannin mordant is fixed previous to dyeing by treatment with a solution of tartar emetic, the usual method being to add the tartar emetic solution to the contents of the drum after the goods have been tumbled for a sufficient length of time in the tannin mordant. A certain amount of the tartar emetic is, of course, wasted by being precipitated by the tannin still remaining in the bath, but the loss is generally considered to cost less than the extra labor and time required by using a fresh liquor. The tartar emetic solution can be recommended when pale shades of gray, drab, ivory, etc., also blues, are to be dyed, but when shades of brown, red, etc., are to be produced, then for the tartar emetic solution there can be substituted with advantage one or other of the salts of titanium, either potassium-titanium oxalate, tanno-titanium oxalate, or titanium acetate.

Notes on Processes, New Colors, etc.

The effect as regards color of treating a leather that has been previously mordanted with one of the tannins (Gambier, Palmetto, Sumach, Hemlock, etc.) with a titanium salt is the production of a bright yellow color, in addition to fixing the tannin in an insoluble form in the fibres of the leather, and thus preventing the tannin precipitating the dye in the dye-bath when the leather comes to be dyed with the basic colors. The yellow color so obtained reduces considerably the amount of the dyestuff necessary to produce the required shades as well as produces a shade which is extremely fast to light. The effect of treating a leather which has been dyed with logwood is to change the violet-purple color to a grayish shade of black, and the bluish-red shade produced when peachwood has been employed to dull reddish-yellow.

Another method of applying the salts of titanium, especially when "acid" or mordant colors are employed in the dyeing, is to dye the goods first in a solution of a suitable coal-tar dye in admixture with the solution of fustic, gambier, or other tannin "mordant," and to afterwards run away the excess of the dye-bath, and then proceed to treat the goods with the solution of the titanium salts.

The dyeing operation is invariably performed in the drum, this being practically the only method of application that gives results which approximate to being satisfactory. The goods after fixing, if this operation is performed (the operation being, of course, optional when dyes which are unaffected by tannin are employed), should be well washed; they are then ready for the application of the dye. The dyeing should be performed at a temperature of about 60° C., and at least three-quarters of an hour's drumming will be necessary to produce a full shade, the dissolved dye being gradually added through the hollow axle of the vessel as the drumming proceeds. When dyed the goods are ready for the fat-liquoring treatment. The fat-liquoring, which is necessary in order to "feed the leather,"—i.e., lubricate the fibres and so produce a leather which is full and soft,—is generally

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added to the exhausted dye-bath whilst the goods are still in the drum, and the drumming continued for half an hour or so, until the whole of the oil-emulsion has been absorbed by the goods. (M. C. Lamb, in *Journal Society Dyers and Colorists*.)

NOTES ON PAPER DYEING.

In paper dyeing, as is well known, there are practically two methods only in general use. In one of these the made-up paper is dyed by the application of the color solution (paper staining); in the other the pulp is dyed in the engine before the paper is made. In staining paper aniline colors dissolved in combination with gelatine, dextrine, or gum are applied to the surface. It is evident from this, only colors can be used which give clear solutions. In dyeing paper pulp, the usual way is to add first the rosin soap, then the color solution, and lastly the fixing agent. The insoluble color lake is thus precipitated on the fibres and the paper sized at the same time. All colors which can be fixed in the above manner may be used.

Care must be taken when dyeing bleached paper pulp that it is entirely free from chlorine, otherwise the color will be destroyed. If the back water is not quite clear, more of the precipitating agents should be added.

In dyeing with Acid colors, the lakes are precipitated according to the nature of the dyestuff by whatever salt is needed—for instance, barium chloride, sugar of lead, etc.

For blotting papers, it is best to use substantive colors without addition.

Fancy mixed papers may be made by adding to the dyed and sized paper pulp, fine jute and cellulose which have been already dyed.

The following method of dyeing is usually followed:

For 100 lbs. paper pulp:

4 lbs. Sulphate of Alumina and

12 lbs. Rosin Soap

Notes on Processes, New Colors, etc.

To increase the fastness somewhat, an addition of Tannin of about 2 to 3 times the weight of the color may be made. The dyestuff solution and the alumina are first added to the pulp and after running for some time the Rosin soap.

To prepare Rosin Soap

Boil 100 lbs. Rosin with

20 lbs. Soda Ash and

20 gallons Water for three hours.

It is then allowed to stand for about two days, the scum removed and then diluted with 10 times the amount of water.

For lithographic papers and others that should not bleed in water, insoluble color lakes are used which are applied by means of glue or gelatine solution after which they are properly finished by calendering or otherwise. (Translated from *Färber Zeitung*.)

METALLIC PRINTING.

Printing and painting with metallic powders date from a very remote period of artistic decorations, even their application to textiles is quite old as is shown by many beautiful specimens of tissues so embellished, but it is only in a recent period that the class of metal-decorated textiles has become popular. As a matter of fact, all woven fabrics are adapted to this kind of work, but the brightness and most pleasing effects are to be noted upon velvet and other allied goods.

Metallie powders adapted for this class of work are readily obtainable, being manufactured in large quantities of all degrees of fineness, and of a great variety of colors, from which many intermediate shades can be prepared, although the color mixer is seldom required to mix his metals to produce a given shade, as but two standard colors are being used—"silver" and "gold."

The principal work of the color-mixer is to compound a "size" of such consistency as will print well, that is, will show a good impression, and to fix the metal permanently to the fabric, or at

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least fix it that it will not readily detach even under a rather vigorous brushing.

Many formulas have been published, but the majority of them have been found wanting in some one quality, so that at the present time there are but few that can be said to possess technical merit. One of these processes is based upon the use of a coagulant—egg albumen—while the other is founded upon a base composed wholly or in part of India rubber.

The preparation of an albumen paste is simple; gum tragacanth of good quality is taken and soaked for 12 hours in cold water, when it is lightly boiled and strained. This gum does not actually dissolve, but swells to a remarkable degree in water, apparently taking up the water and holding it mechanically. A suitable quantity of egg albumen is likewise soaked in cold water until a smooth product is secured; heat must not be applied. When both pastes are ready they are mixed together with the proper quantity of metallic powder, then after thorough stirring the finished paste is ready for printing.

The practical working quantities of this type of paste would be as follows:

Tragacanth paste (65 to 1000).....	1	gallon
Egg Albumen water (1:1).....	2½	gallons
Metallic powder.....	15	pounds

This gives nearly 4 gallons of "color."

After printing, dry and steam at 212° F., when the albumen coagulates and becomes insoluble, at the same time fixing the fine particles of metal so that they cannot subsequently be removed. The steaming and final drying should be the last operations to which the goods are subjected except, possibly, a brushing before final inspection and packing, all other operations being done before printing.

The rubber printing paste is of the nature of a varnish and requires, after being printed, to be aged and dried before further

Notes on Processes, New Colors, etc.

handling on account of the sticky nature of the paste. The following recipe yields a high class product and one similar to that used on the very highest class of manufactures.

Para rubber	4 pounds
Camphor oil	8 "

Thoroughly incorporate by heating over a fire in a large pan or kettle. When the rubber has dissolved remove from the fire and while still hot add with steady stirring:

Coal-tar naphtha, 2 quarts; followed by copal varnish, 1 quart; stirring thoroughly and uniformly, afterwards covering and allow to become cold.

Gun cotton (or pyroxyline) varnishes are not adapted as adhesives for this class of decorative textile printing, especially for fabrics to be used for dress goods, but for other uses it is permissible, for instance, book-binders' plushes, etc.

At all events the printing impression should be clear and sharp, and no doubt for general use the albumen paste will be found the most satisfactory, as it can easily be made to any consistency and be applied upon a cylinder machine. The other pastes are especially adapted for perotine or block work. (*Textile World Record*.)

BLACK ON TIN WEIGHTED SILK.

In a recent English patent there is a description of a method of dyeing a blue-black on silk which has been weighted with tin. The objections to the former methods appear to have been overcome and the inventor claims that perfectly satisfactory results are obtained when his methods are followed.

The silk is boiled off and put in a cold solution of stannic chloride for one hour, washed, and then worked in a solution of phosphate of soda or other alkali for an hour, then washed and worked for another hour in a solution of silicate of soda or other alkali. The silk is again washed and goes back into the stannic

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chloride, is washed and goes again into phosphate of soda, is washed and then goes into silicate of soda. This order of treatment: Stannic chloride, then phosphate of soda, then silicate of soda can be repeated, until the desired weight is obtained.

It can also be worked in such a way that the silk is only put alternatively in stannic chloride and phosphate of soda, and a solution of silicate of soda applied after the last phosphate of soda or the last tin bath, or it can be done entirely without silicate of soda, only tin and phosphate of soda being used alternatively. Instead of phosphate of soda and silicate of soda, a solution of ammonia or a carbonate of soda or potash can be used between the applications of the tin salt. The silk can also be put in a solution of a metallic salt, for instance, sulphate of alumina or sulphate of zinc, before or after each treatment in the phosphate of soda or the silicate of soda, or only after the one.

To obtain the blue-black shade with black-iron, it is immaterial after which solution the weighting is stopped, after the treatment of the silk in a solution of tin, or after treatment in the solution of phosphate of soda, or after treatment in a solution of silicate of soda, also treatment with a diluted acid or alkali does not interfere with the result.

After the silk is weighted in the above manner, it is put into a solution of iron in crude acetic acid of $1\frac{1}{2}^{\circ}$ to $7\frac{1}{2}^{\circ}$ Tw. The stronger this solution of black-iron is used, the bluer the shade will turn out. The silk is worked in the black-iron for one hour, then wrung, washed, and then worked in a solution of gambier or other tannic material, to which has been added a certain quantity of logwood extract and fustic extract or other vegetable yellow dye-stuff, this quantity varying according to the shade desired. The silk is worked in this solution of gambier for about two hours, then washed and dyed in a solution of logwood extract and soap together, the shade becoming bluer by increasing the temperature. After the desired shade has been obtained by slowly increasing the temperature, the silk is washed and finished with a diluted solution of acid and oil.

Notes on Processes, New Colors, etc.

The new treatment to obtain a blue-black weighted 16 to 18 ozs. is as follows:

The silk is put in a solution of tetrachloride of tin of 53° Tw. cold for one hour then washed and worked in a solution of phosphate of soda or 6° Tw. 150° F. warm for one hour, then washed and worked in a solution of silicate of soda 4.5° Tw. and 120° F. warm for one hour, then washed and worked in a solution of 14 per cent. acetic acid. Then the silk is worked in a solution of black-iron of 77° Tw. and 60° F. for one hour, wrung, covered for two hours, then washed and worked in a solution of 100 lbs. gambier for 100 lbs. of silk, to which solution 20 lbs. of logwood extract and 40 lbs. of fustic extract per 100 lbs. of silk is added, and which solution is at 160° F. worked for two hours, washed and dyed in a solution of 20 lbs. logwood extract per 100 lbs. of silk and 50 lbs. of soap per 100 lbs. of silk, the logwood extract and the soap being put together. The silk is put in this solution of logwood extract and soap at a temperature of 110° F. and while worked the temperature is slowly increased until the desired blue shade is obtained. A good blue-black is generally obtained at about 150° F., but it varies according to the nature of the silk and the difference in the weighting process. After the desired shade is obtained, the silk is washed and finished as usual.

The amount of weighting may be increased by increasing the number of alternate treatments with Tetrachloride of tin and Phosphate of Soda, the dyeing in any case is the same as above described.

The blue-blacks so obtained are especially valuable on account of evenness in color. While higher weights can be obtained than was formerly possible by means of red-iron, because the silk suffered too much in the long process with the red-iron, it is claimed that lighter weighted silks can be produced much cheaper by this process. (J. A. Knup. *Journal Society Dyers and Colorists.*)

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THIOGENE COLORS IN PRACTICE.

STORING.—As the Thiogene dyestuffs, on account of the method of making, contain more or less alkaline sulphides and are therefore somewhat hygroscopic, it is recommended to keep these colors in a dry room free from steam. Also the contact with acid or acid salts is to be avoided. After taking out dyestuff, the package should be carefully closed.

DISSOLVING.—It is best to make the color in a paste with hot water in a wooden vessel, and then add the prescribed amount of sodium sulphide, and then boil up the whole with more water, while stirring. The color solution is then added to the dyebath, and last of all the salt.

Copper or brass pipes or fittings cannot be used and should be replaced with either iron or lead. Melanogene Blue B pat. and Melanogene G and T are dissolved without sodium sulphide at 175° F. with the addition of soda.

MACHINERY.—The relatively large amount of alkaline sulphide in the dye liquor prevents the use of copper or brass apparatus, which would themselves be strongly attacked and also injuriously affect the dyestuff solution in working with Thiogene colors. Therefore only wood, iron, or lead kettles and machines are used.

MAKING UP THE DYEBATH.—The dyebaths for Thiogene colors are made up in the following order:

1. Dyestuff.
2. Sodium Sulphide.
3. Sodium Carbonate (Caustic Soda if necessary).
4. Glauber's Salt or common salt.

The sodium sulphide is used to dissolve the dyestuff; a small excess of sulphide is without injurious action on the dye-liquor, but too small a quantity results in the precipitation of the dyestuff. This is indicated by the bath becoming cloudy and may be

Notes on Processes, New Colors, etc.

detected by dipping in a piece of blotting paper which collects the separated dyestuff. If this condition appears the dyestuff must be dissolved by the further addition of sodium sulphide. This is particularly necessary when the sodium sulphide is oxidized, either by hard continuous boiling, or long standing of the dyebath. It is then boiled up with nearly the usual three times the weight of the dyestuff of sodium sulphide and the dyebath is again ready for use.

Sodium carbonate and caustic soda aid in dissolving without hindering the reducing action of the sodium sulphide.

Common salt or Glauber's salt aids in fixing the dyestuff on the fibre and increases the exhaustion of the bath without, however, being necessary under all circumstances. Generally speaking it is a fixed rule that the more salt is required, the deeper the shade or the larger the dyebath; that is the greater the proportion of liquor to material. For this reason the amount of salt is reduced in short baths when deep shades are to be dyed. But in light compound shades, which are also dyed in long baths, it is necessary on account of equalizing to avoid quick exhaustion of the bath and the addition of salt is omitted.

The addition of a small amount of Turkey-Red Oil is recommended, it acts as a softener and assists in equalizing.

THE CONCENTRATION OF DYEBATH AND PROPORTION TO MATERIAL.—The amount of color and sodium sulphide in the dyebath is based on the depth of the shades to be dyed, but it is to be noted that in light shades the proportion of sodium sulphide is increased and that of the salt reduced or in some cases omitted. The addition of salt and sodium carbonate in full shades should be so regulated that the bath shows a gravity of 7° Bé. If it falls below this the dyestuff generally will not exhaust, and if it rises above 9° Bé. many dyestuffs will bronze. It is recommended to control this by the use of a hydrometer.

The proportion of dyebath to material is of great importance in dyeing with Thiogene colors.

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The proportions are in general:

For yarn dyeing in kettle	1:20
For raw cotton in kettle	1:20
For piece goods on jigger	1:5
For dyeing in machine	1:4 to 1.20

With these proportions in starting fresh baths and feeding old ones care must be taken and the addition of salt and soda especially regulated, so that the proper density of the bath, about 7° Bé. is maintained.

TEMPERATURE OF THE DYE BATH.—The material is entered in the boiling bath, the steam turned off, and during the dyeing operation the bath is brought to a boil once or twice. In working with the jigger the bath is heated constantly with steam coils to 200° because this method of dyeing causes rapid cooling.

Experiments have shown that in medium shades a temperature of 120° F. will give almost as deep shades as the higher temperature. This indicates that the Thiogene colors can also be used for cold dyeing. The dyeings are equally fast whether made hot or cold.

The length of time required varies according to the materials and the method. In dyeing cotton yarn in the kettles an hour's working is necessary. With lighter shades, which are dyed usually at 100° to 120° F. a shorter time will be sufficient. Practical experience will show the time necessary in each instance.

LEVEL DYEING.—The former difficulties of Sulphur colors which showed bronze and unequal spots through the oxidation by the air is overcome in the Thiogene colors. They are generally so stable that they may be dyed in the open bath, in an ordinary kettle, except a few which must be kept under the liquor. In dyeing light compound shades on yarn, which are apt to become streaky, this difficulty may be avoided by working at lower temperature and increasing the proportion of sodium sulphide and leaving out the salt from the dye bath. The addition of Turkey Red Oil will also be of service.

Notes on Processes, New Colors, etc.

WASHING.—Immediately following the dyeing operation with Thiogene colors, the materials should be well and evenly squeezed. This is absolutely essential for proper working. For this purpose squeeze-rollers of iron covered with rubber are used; in the case of raw stock, the hydroextractor. Generally for washing, water is sufficient without further addition. The washing is continued until the water runs off clear; then the material is squeezed and ready for drying.

For brightening the shades of these colors, especially Blacks, oil or other fats may be added to the last wash water. For this treatment which is carried out at 125° to 160° F., soap, and oil or fat, with or without starch are used.

With 1 per cent. lard and 1 per cent. starch the shade of the Black becomes deeper, but is not altered.

With 3 per cent. olive fig soap the shade is fuller and somewhat bluer. Castile soap does not give as good results.

AFTER-TREATMENT.—Thiogene colors can be after-treated in four ways:

1. With alkaline salts.
2. With metallie salts.
3. With steam in the presence of air.
4. By hanging or smothering in moist heat.

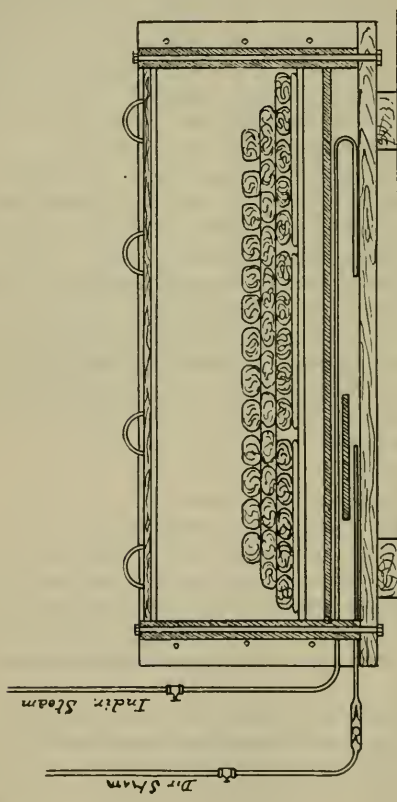
1. **AFTER-TREATMENT WITH ALKALIES OR ALKALINE SALTS,** such as ammonia, soda, borax, sodium acetate, etc., is only used if the dyeings have been treated with acid—for instance, after the acid overdyeings of wool in half wool and goods with cotton warps, and also if shades have been after-treated with metallic salts.

2. **METALLIC SALTS.**—The after-treatment of Thiogene colors with metallic salts has the advantage that it renders them somewhat faster to light and exposure. For this purpose chrome and copper salts are used. The after-treatment generally causes a slight change in the appearance of the shades, which mostly improves them.

3. **DEVELOPMENT WITH STEAM.**—This method is used with

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several of the Thiogene Blues. After dyeing and before washing

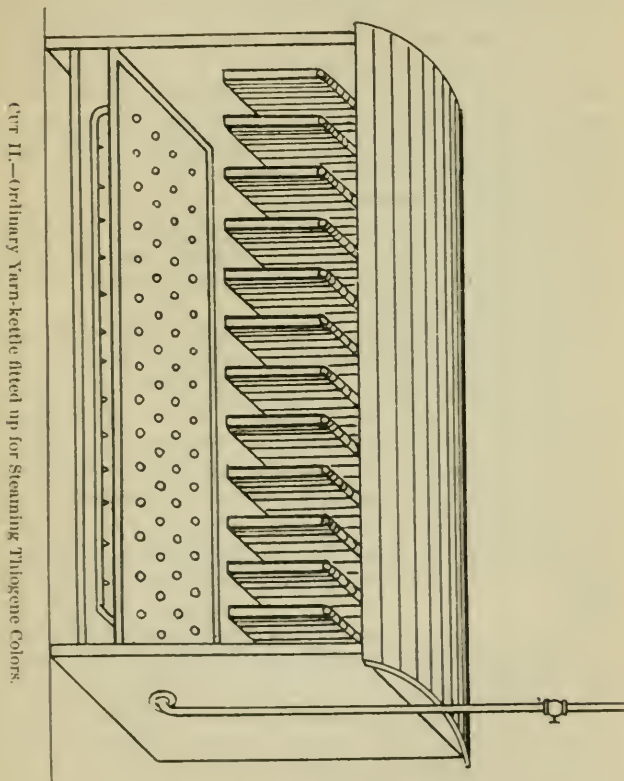


Cut I.—Steam-box for Developing Thiogene Colors.

the well squeezed or extracted material is steamed for one hour in a suitable box with a mixture of steam and air.

Notes on Processes, New Colors, etc.

Cut I. is a sketch of a box for this purpose. The direct steam pipe is fitted with an air injector. An ordinary dye kettle



can be fitted up in an easy manner for doing this work as shown in Cut II.

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The steam box should have steam coils for heating in addition to the direct steam for developing.

Before putting in the yarn, the box is heated up and then the yarn, made up into loose bundles, is laid on the false bottom. The box should have a well fitted cover which during operation is covered with burlap. The bundles of loose yarn should be lifted in pairs of three deep, or with smaller amounts, sometimes in two or only part of the bottom may be covered. Care should be taken that the yarn is not tightly twisted together. The development should take place in one-half hour and the yarn is then taken out and washed.

Loose cotton can be developed by steaming in a similar manner.

In the case of other forms of material, such as cops, etc., which are ordinarily dyed in machines, the steaming can be done directly in the machine.

After steaming, in many cases the shade can be brightened by an addition of hydrogen peroxide to the wash water.

4. DEVELOPMENT BY AGEING OR SMOTHERING.—Several of the Thiogene colors, especially Thiogene Blue B, can be developed by ageing for 1 to 2 hours instead of steaming.

Yarn, for example, is wrung out evenly and before washing hung up on sticks and allowed to remain at ordinary temperature for 1 to 2 hours, then it is well washed. Many times, especially in the case of chain warps and loose cotton, the material is thrown in piles, covered, and allowed to smother for several hours.

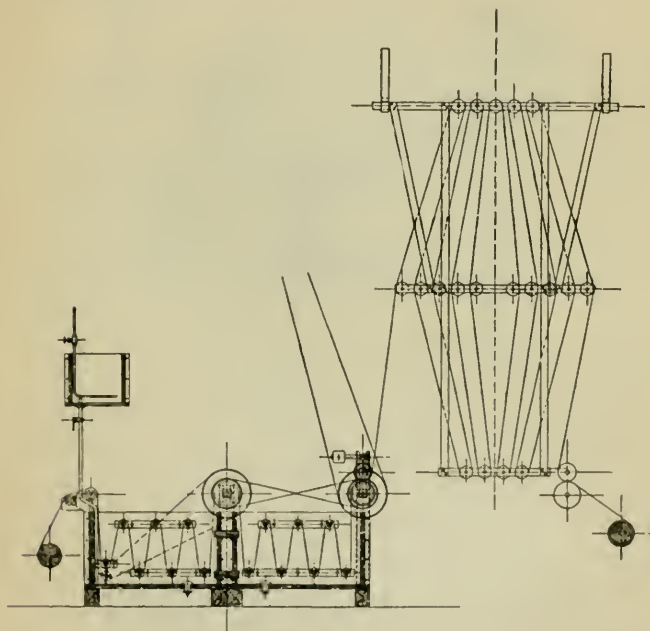
In dyeing piece goods, where a large production is required, a continuous machine is made up of a dye-box in combination with a system of rollers for airing off the goods immediately after their passage. The length of goods on these rollers should be about 20 to 25 yards so that the hot dye-liquor is perfectly cold before they are folded down or rolled up. Cut III. shows a sketch of one of these machines.

In dyeing Thiogene Blue on this machine a dark shade can be done in one run at the rate of about 600 yards per hour, but as

Notes on Processes, New Colors, etc.

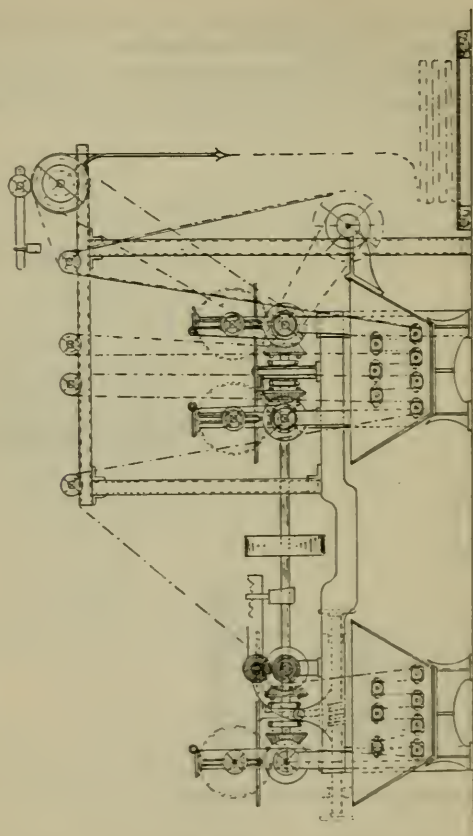
this is more than the average dye-house requires, Cut IV. shows a machine which is suitable for smaller lots.

THIOGENE COLORS AS A BOTTOM FOR OTHER DYESTUFFS.—The Thiogene colors can be used as a bottom for Aniline Black, the



CUT III.—Continuous Dyeing Machine for Thiogene Colors.

ones most suitable for this purpose being blues and blacks. In some cases they can also be used as a ground for Paranitraniline Red and in this way dark shades of claret, crimson, and dark browns can be obtained. With shades dyed in this way the



CUT IV.—Small Dyeing Machine for Thiogene Colors.

Paranitraniline Red can be discharged with Hydrosulphite NF and in this way the patterns show combination of the original Thiogene color on the various colored ground as obtained above.

Notes on Processes, New Colors, etc.

TOPPING WITH BASIC COLORS.—Small amounts of basic colors can be used to shade the dyeings obtained with the various marks of Thiogene colors. In this way shades can be matched and the necessary brightness obtained which is not possible with the direct dyeings.

DYEING METHODS.

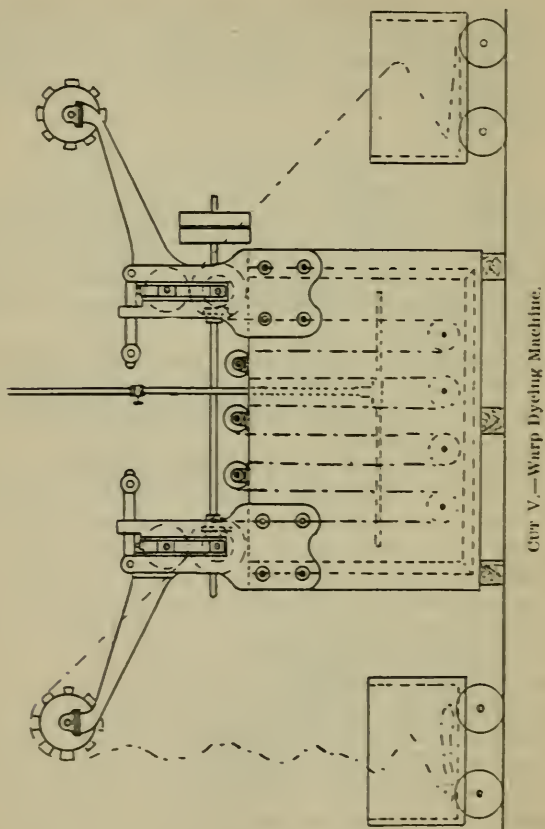
In general, the methods of using the Thiogene colors are precisely the same as for direct colors. One important difference is, however, that immediately following the dyeing, the excess of dyebath should be removed and the stuff well washed. Both of these are necessary for economical working and proper condition of the dyed material.

The machines for dyeing these colors should be practically the same as for other cotton dyeing but the working parts must be of iron and proper means provided for removing the excess of dye-liquor as above noted.

DYEING OF RAW COTTON IN THE KETTLE.—The dry material is entered in the boiling dyebath and worked for $\frac{1}{4}$ of an hour until thoroughly wet out. Then the steam is shut off with the temperature kept at 200° for $\frac{3}{4}$ of an hour. The material is then thrown out, the excess of dye-liquor allowed to run back in the bath after extracting in an iron or lead hydroextractor, then washed and allowed to lie several hours or over night. By lying the tone, especially the blacks, becomes fuller.

MACHINE DYEING.—The various forms of machines which have been invented during the last years for sulphur dyeing, can be advantageously used with the Thiogene dyestuffs, the latter being very soluble and not readily liable to surface oxidation. Particular methods, of course, are necessary in using the different forms of machines and each maker has specific methods of handling the material.

DYEING OF YARN IN THE KETTLE.—Either the gray or boiled out yarn is entered in the boiling bath and turned briskly for a few minutes. When thoroughly wet out, the steam is shut off



and then the yarn turned every five minutes until the dyeing is finished. This requires for dark shades about 1 hour and for lighter shades somewhat less. Bent sticks are only necessary

Notes on Processes, New Colors, etc.

when Thiogene Blues are to be dyed; the other colors can be dyed in the usual way.

The best way to heat the kettle is with indirect steam in iron pipes. After dyeing the yarn should be squeezed out and immediately washed. For proper handling it is well to have one squeeze-roll at the end of the kettle and a kettle next to this, so that the yarn can be immediately squeezed out and put in the wash water. Usually three wash waters are necessary. The first one, which contains a large quantity of dyestuff, can be used to replenish the amount of dye-liquor taken out by the yarn.

Various machines for dyeing yarn have been lately brought out, some of which work very well with these colors.

CHAIN WARP DYEING.—Of the several methods of chain warp dyeing the one least in use at the present time is the reel kettle. In this the material is entered in the boiling bath and the steam being shut off, is given several runs and then allowed to stand in the dyebath. Every 15 minutes it is again run over the reel and the dyeing completed in about one hour. It is then well squeezed and washed.

The method mostly used at the present time is the continuous dyeing machine which is the simplest and most easily handled. Cut V. shows a machine in general use in England and the United States.

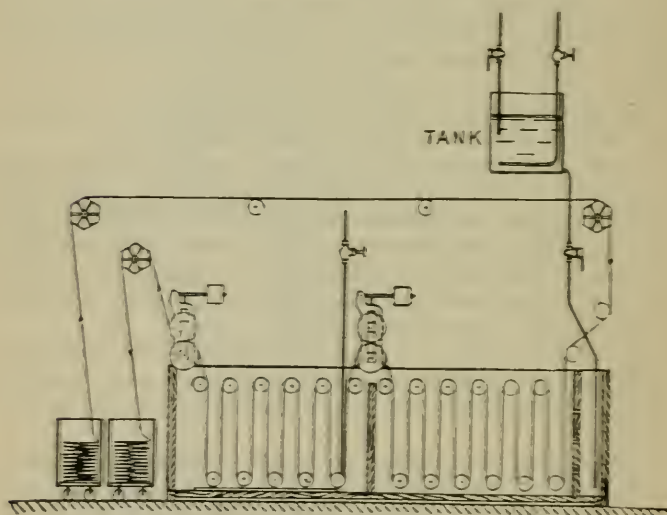
This consists of a square box which is fitted with squeeze-rolls either at both ends or at the last end. If it has two sets of squeeze rolls, this arrangement with the warp may be run forward and back. With one set of squeeze rolls, warps are run in one direction, the ends being reversed at each run. Six to 8 warps can be run on this machine at one time and with proper methods of feeding two runs are sufficient for most shades to be dyed with Thiogene colors.

Another form of machine is shown in Cut VI., which is suitable for dyeing with Melanogene Blue B and similar colors.

As shown in the drawing, the apparatus is arranged so that

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the warps leave the dye liquor at the end of the machine from which they are started. They first run over a winch on rollers to the back part of the machine and are then passed through the liquor box containing the dye-liquor; next, through squeeze-rollers, and, finally, laid down in a wagon. According to the depth of the shade required, two to four passages are given.

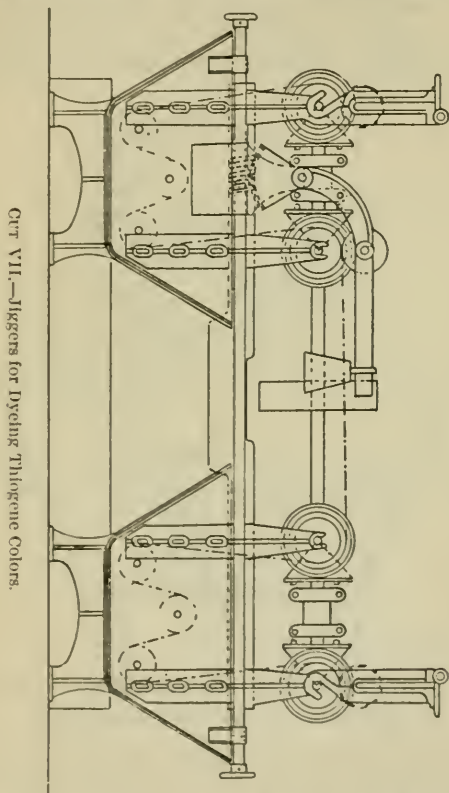


CUT VI.—Warp Dyeing Machine.

DYEING OF PIECE GOODS AND WEBBING.—In piece dyeing the kettle with a reel is seldom used and the continuous machine only for special work on staple goods where a large production is necessary. Padding machines are also only used in special cases. The principal machine for dyeing cotton piece goods is the jigger. These colors can be dyed on the jigger without

Notes on Processes, New Colors, etc.

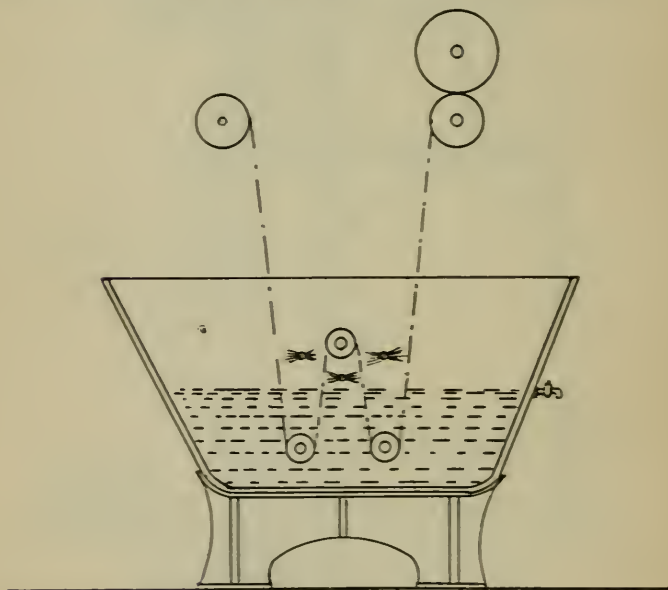
difficulty if precautions are taken to keep the selvages of the goods even and prevent the formation of folds while running.



The dye boxes should be made of wood or iron and the rolls of the same, preferably with hard wood bearings. It is of advantage to use the jiggers in pairs as in Cut VII.

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The first jigger or the one used for dyeing, is fitted with a rubber squeeze-roll which has a suitable arrangement for raising it and lowering it. This squeeze-roll is used when the dyeing operation is finished and the cloth is run directly from this into the washing jigger. In this the goods are run until the wash



CUT VIII.—Jigger for Washing with Spray Pipes.

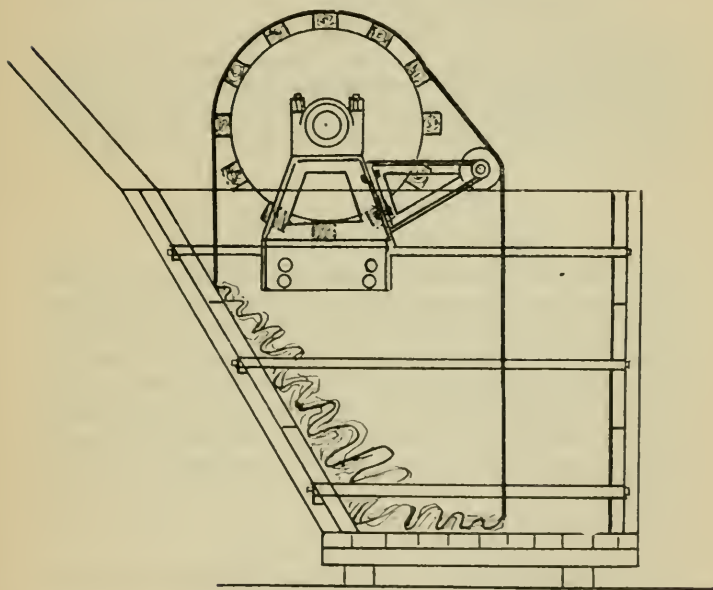
water is clear. In large dye-houses, these jiggers are often arranged in rows.

In jigger dyeing a short bath is used in the proportion of 1-3 to 1-5. Generally indirect steam is used for heating. The dyeing operation usually requires 1 hour. Material which the pressure

Notes on Processes, New Colors, etc.

of the rolls may injure such as velvets, etc., is not squeezed after dyeing but directly washed. In that case the jigger should be fitted with spray pipes as shown in Cut VIII.

Very wide webbing can also be dyed in jiggers, but this is usually done by hand, while one workman turns, another keeps



CUT IX.—Dyeing Machine for Webbing.

the stuff out at full width. In this way the dyeing can be run a longer or shorter time as may be necessary according to the weight, etc., of the material.

Narrow webbing can be dyed in the machine of which cut is shown.

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In small quantities knit goods can be simply poled in an open kettle under the surface and then taken out of the box and drained off quickly and washed.

THE DRYING OF MATERIAL DYED WITH THIOGENE COLORS.

In general the usual drying cans suitable for cotton may be used with these colors. The blacks should not be dried very hot nor too quickly. For black piece goods it is especially recommended to dry them in rooms and not on drying cans. If this is not possible the first few cans should be lapped.

THIOGENE BLACKS.

AFTER-TREATMENT WITH METALLIC SALTS.

The fastness of the direct dyeings of these colors is so satisfactory that any after-treatment makes very little improvement, but the fastness to boiling soap and soda may be increased by treating with alkaline chromate solution and the fastness to light by treatment with copper and acetic acid or chromium salts, if the use of copper is not desirable. Generally the direct dyeings will satisfy all requirements, and the after-treatment is used only where extraordinary fastness is needed.

Following are the usual fixing baths with the changes in shade caused by each of them.

3% Copper Sulphate	}	Shade becomes deeper and browner.
3% Acetic Acid		
3% Bichromate	}	Shade becomes bluish violet.
3% Acetic acid		
2% Bichromate	}	Shade becomes more violet.
2% Copper sulphate		
2% Acetic acid		

Notes on Processes, New Colors, etc.

3% Bichromate	}	Little change.
5% Caustic soda sol. 40° BÉ.		
1½% Chrome alum	}	Shade becomes bluer.
1½% Bichromate		
3% Acetic acid		
2% Chromium fluoride	}	Shade becomes greener.
2% Acetic acid		

The dyeings are usually worked in these fixing baths for one-quarter to one-half hour at 175° F. and then washed and finished as usual.

THIOGENE BLACK M CONC.

This gives a full deep black of a medium shade such as is generally used. As it is exceptionally fast to all requirements and is easily handled on account of its ready solubility, it is recommended for all varieties of cotton dyeing, and will be found of very great service when machines are used.

It can be used for raw cotton, yarns, chain warps, etc. In piece dyeing it does not bronze and the edges are clear.

The proportions of dyestuff and other materials are shown in the following table.

FOR 100 LBS. MATERIAL.

RAW COTTON IN KETTLE.

	1st Bath.	2d Bath.	Standing Bath.
Dyestuff	10 lbs.	7½ lbs.	5½ lbs.
Sodium sulphide cryst.	30 lbs.	15 lbs.	11 lbs.
Sodium carbonate dry (58% alkali)	10 lbs.	4 lbs.	2 lbs.
Salt	50 lbs.	15 lbs.	3 lbs.

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COTTON YARN IN KETTLE.

	1st Bath.	2d Bath.	Standing Bath.
Dyestuff	9 lbs.	6½ lbs.	5 lbs.
Sodium sulphide cryst.....	27 lbs.	13 lbs.	10 lbs.
Sodium carbonate dry	9 lbs.	2 lbs.	2 lbs.
Salt	40 lbs.	15 lbs.	3 lbs.

PIECE GOODS IN JIGGER.

	1st Bath.	2d Bath.	Standing Bath.
Dyestuff	11 lbs.	9¼ lbs.	8 lbs.
Sodium sulphide cryst.	33 lbs.	19 lbs.	16 lbs.
Sodium carbonate dry	5 lbs.	3 lbs.	1 lb.
Glauber's salt	15 lbs.	5 lbs.	2 lbs.

WEBBING ON REEL.

	1st Bath.	2d Bath.	Standing Bath.
Dyestuff	10 lbs.	8 lbs.	6 lbs.
Sodium sulphide cryst.	30 lbs.	16 lbs.	12 lbs.
Sodium carbonate dry	5 lbs.	2½ lbs.	1 lb.
Glauber's salt	40 lbs.	15 lbs.	3 lbs.

LINEN YARN IN KETTLE.

	1st Bath.	2d Bath.	Standing Bath.
Dyestuff	7 lbs.	5 lbs.	3½ lbs.
Sodium sulphide cryst. ...	21 lbs.	10 lbs.	7 lbs.
Sodium carbonate dry	6 lbs.	3 lbs.	1½ lbs.
Salt	30 lbs.	10 lbs.	2 lbs.

THIOGENE BLACK MR CONC.

This has the same strength and general characteristics of Thiogene Black M conc., but with a somewhat heavier and redder

Notes on Processes, New Colors, etc.

shade. The method of using and manner of handling is exactly the same, and it may be used for the same kinds and classes of material.

These proportions of materials will give good results:

FOR 100 LBS. MATERIAL.

COTTON YARN IN KETTLE.

	1st Bath.	2d Bath.	Standing Bath.
Dyestuff	10 lbs.	8 lbs.	6 lbs.
Sodium sulphide cryst.	30 lbs.	16 lbs.	12 lbs.
Sodium carbonate dry	10 lbs.	3 lbs.	2 lbs.
Common salt	50 lbs.	15 lbs.	3 lbs.

PIECE GOODS IN JIGGER.

	1st Bath.	2d Bath.	Standing Bath.
Dyestuff	11 lbs.	9½ lbs.	6 lbs.
Sodium sulphide cryst.	33 lbs.	19 lbs.	16 lbs.
Sodium carbonate dry	5 lbs.	3 lbs.	2 lbs.
Glauber's salt	10 lbs.	5 lbs.	..

THIOGENE BLACK BB CONC.

This mark, on account of its full rich tone of blue-black with a violet shade, is recommended especially for mercerized material.

The dyeing method being the same as for the other Thiogene colors, it can be used in combination with them, and especially with the other blacks for shading, so that any desired shade of black may be obtained.

The lists in piece dyeing do not bronze, and therefore it can be used in the jigger.

The proportions follow:

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FOR 100 LBS. MATERIAL.

YARN IN KETTLE.

	1st Bath.	2d Bath.	Standing Bath.
Dyestuff	12 lbs.	10 lbs.	7½ lbs.
Sodium sulphide cryst.	36 lbs.	20 lbs.	15 lbs.
Sodium carbonate dry	10 lbs.	5 lbs.	2 lbs.
Salt	50 lbs.	10 lbs.	5 lbs.

MERCERIZED GOODS IN JIGGER.

	1st Bath.	2d Bath.	Standing Bath.
Dyestuff	13 lbs.	10 lbs.	7½ lbs.
Sodium sulphide cryst.	40 lbs.	20 lbs.	15 lbs.
Sodium carbonate dry	5 lbs.	3 lbs.	1 lb.
Glauber's salt	15 lbs.	5 lbs.	2 lbs.

THIOGENE DIAMOND BLACKS B AND V.

These blacks are recommended on account of their clearness in shade, both as single colors and in combination with the other brands of black. The B mark gives a full blue-toned black, while the V has a full violet tone. These, with the other marks, give a full line of black shades suitable for all methods of dyeing on all kinds of material.

The proportions are:

FOR 100 LBS. MATERIAL.

COTTON YARN IN KETTLE.

	1st Bath.	2d Bath.	Standing Bath.
Thiogene diamond black B.	20 lbs.	16 lbs.	12 lbs.
Sodium sulphide cryst. ...	30 lbs.	16 lbs.	12 lbs.
Sodium carbonate dry	10 lbs.	3 lbs.	2 lbs.
Common salt	40 lbs.	10 lbs.	3 lbs.

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COTTON YARN IN KETTLE.

	1st Bath.	2d Bath.	Standing Bath.
Thiogene diamond black V..	15 lbs.	12 lbs.	9 lbs.
Sodium sulphide cryst. ...	30 lbs.	12 lbs.	9 lbs.
Sodium carbonate dry	10 lbs.	3 lbs.	2 lbs.
Common salt	20 lbs.	4 lbs.	2 lbs.

PIECE GOODS IN THE JIGGER.

	1st Bath.	2d Bath.	Standing Bath.
Thiogene diamond black B..	22 lbs.	18 lbs.	12 lbs.
Sodium sulphide cryst. ...	33 lbs.	18 lbs.	12 lbs.
Sodium carbonate dry	5 lbs.	2½ lbs.	1 lb.
Glauber's salt cryst.	10 lbs.	..	..

PIECE GOODS IN THE JIGGER.

	1st Bath.	2d Bath.	Standing Bath.
Thiogene diamond black V..	18 lbs.	14 lbs.	9 lbs.
Sodium sulphide cryst. ...	36 lbs.	21 lbs.	12 lbs.
Sodium carbonate dry	5 lbs.	2½ lbs.	1 lb.
Glauber's salt cryst.	5 lbs.	..	..

THIOGENE BLACK 4B CONC.

Thiogene Black 4B conc. gives a full shade of black still bluer in tone than BB conc. It may be used alone for producing blue-blacks or in combination with the other marks for making the shade of these bluer.

It has the same properties and advantages of the other concentrated Thiogene blacks and is dyed in exactly the same way.

FOR 100 LBS. GOODS.

COTTON YARN IN KETTLE.

	1st Bath.	2d Bath.	Standing Bath.
Dyestuff	11 lbs.	9 lbs.	7 lbs.
Sodium sulphide cryst.	33 lbs.	18 lbs.	14 lbs.
Sodium carbonate dry	10 lbs.	3 lbs.	2 lbs.
Common salt	50 lbs.	10 lbs.	3 lbs.

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PIECE GOODS.

	1st Bath.	2d Bath.	Standing Bath.
Dyestuff	11 lbs.	9 lbs.	6 lbs.
Sodium sulphide cryst.	33 lbs.	18 lbs.	12 lbs.
Sodium carbonate dry	5 lbs.	3 lbs.	2 lbs.
Common salt	10 lbs.	3 lbs.	..

THIOGENE ORANGES OG, RG, R, AND 2R.

These colors are dyed like the other brands of Thiogenes and have the same characteristics and advantages. They dye level, and on account of their solubility are suitable for use in machine dyeing. The method is the usual one: they are dissolved with Sodium Sulphite and added to the dyebath which contains the Sodium Carbonate and salt or Glauber's Salt. The kettle is boiled, the steam shut off, and the dyeing continues at a temperature of 180° to 200° for one hour.

The material may be washed immediately after dyeing. While an after-treatment with metal salts is not necessary, the fastness to light is increased by treatment with copper salts, but the shades are turned somewhat brownish.

Like all other sulphur colors, they must be dyed in wooden or iron vessels, and the presence of brass or copper in the dyebath avoided. In running standing baths, only two-thirds of the quantity of dyestuff used for starting is necessary. These colors are recommended for all sorts of cotton and linen dyeing on account of their fastness to washing and also to boiling soap, soda, and acid. They do not stand chlorine, the dyeings becoming light brown when exposed to its action.

THIOGENE VIOLET V.

This new member of the Thiogene group is one particularly characterized by being the reddest known sulphur color. It is easily soluble, dyes evenly, and gives shades which are very fast.

It is dissolved in the usual way with Sodium Sulphide in hot

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water. The quantity of Sulphide required is about one-half that of the color.

The dyeings require about one hour at 200° F. Soda and salt may be added to the dyebath, but are not absolutely necessary. After dyeing, the material is squeezed out or extracted and well washed. In standing baths about eighty per cent. of the starting quantity is needed. Like all the sulphur colors, it should be dyed in wooden or iron kettles; copper or brass must be avoided. By after-treatment with copper or chromium salts the dyeings are made faster to light. Copper sulphate alone makes the shade somewhat bluer, while a mixture of Copper Sulphate, Bichromate, and Acetic Acid does not materially alter it. The resulting dyeings are fast to washing, fulling, and do not bleed into the white. They also stand boiling Soda and acid, but the fastness to chlorine is not satisfactory.

It is recommended for all kinds of cotton goods, and on account of its brightness of shade may be topped with basic colors, producing bright and fast shades. It can also be used for discharge printing, as it gives clear whites with chlorate discharge.

THIOGENE KHAKI O.

This new sulphur color, which gives the usual U. S. Government shade, is dyed in a boiling alkaline salt bath, and is suitable for all kinds of cotton dyeing where great fastness is required.

While the direct dyeings are generally sufficiently fast, an after-treatment with copper increases the fastness to light and does not materially alter the shade.

In dyeing only salt is used in the dyebath and the dyeings are boiled for one hour. In dyeing piece goods on the jigger, the addition of a small quantity of soluble oil is recommended.

FAST AZO GARNET BASE M.

The clarets obtained by the use of alphanaphthylamine in combination with beta-naphthol being so difficult to discharge to a

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clear white, the Farbwerke vorm. Meister Lucius & Brüning have introduced this product for the production of garnet shades on cotton goods which yield perfectly white discharges with Hydrosulphite NF Hoechst. These have the same fastness to light and soap as those obtained from alphanaphthylamine, and also have the advantage that no ice is required in the process of diazotization.

In diazotizing this, the proper method is to prepare a nitrite paste and then stir this quickly into diluted Hydrochloric Acid; a small residue remains, which is filtered before using.

The usual naphthol grounding is required and the coupling takes place quickly, so that the material can be washed and soaped in a short time after dyeing.

While the tin salt or sulphite resists are not good, the discharges by means of Hydrosulphite NF are excellent. In discharging with this, the discharge paste differs from that used for paranitraniline, in that it should be slightly acid, and a small addition of formaldehyde increases the stability.

The following formulas give good results:

NAPHTHOL GROUNDING.

- 3 lbs. Beta Naphthol
- 3 qts. Caustic Soda 22° Bé.
- 10 lbs. Tragacanth 6:100
- made up with water to 25 gallons.

DIAZOTIZATION.

- 4½ lbs. Fast Azo Garnet Base M are rubbed into a paste with
- 2 lbs. Tragacanth Solution 60:100
- 1 gal. Water
- 5 lbs. 3 ozs. Sodium Nitrite solution 29:100 are mixed rapidly with:
- 10 gals. Water

Notes on Processes, New Colors, etc.

6 lbs. Hydrochloric Acid 22° Bé.

stirred thoroughly for five to ten minutes, strained, and made up with water to 25 gallons. Before using, add

6 lbs. Sodium Acetate Crystals.

DISCHARGE WHITE NF, S 450.

9 lbs. Hydrosulphite NF are dissolved in

1 qt. Water at 120° F. and

2½ ozs. Formaldehyde, 40%, added. Then add slowly to

3 1/5 ozs. Hydrochloric Acid 22° Bé. and

10 ozs. Water. Stirred thoroughly into

8 lbs. Gum Solution 1:2.

HYDROSULPHITE TANNIN SOLUTION.

7 lbs. Hydrosulphite NF are dissolved in

1½ lbs. Water at 120° F. Cool, and add slowly with constant stirring to a solution of

1 lb. Tannin

4 ozs. Acetic Acid 8° Bé.

12 ozs. Water

1½ ozs. Formaldehyde, 40%.

The foam produced by mixing these together rapidly subsides.

Before use, the Hydrosulphite Tannin Solution is warmed slightly, in order to dissolve the crystals, which may separate. This is used in combination with basic colors for the production of colored discharges; the proportions of color used naturally vary with the color and depth of shade desired. In practice the goods are dyed and soaped and dried, then printed with the discharges and dried again. The latter drying should not be sharp. After this they are steamed for three to five minutes in the Mather-Platt, and with colored discharges are given a passage through Tartar Emetic and washed in the open washer. The re-

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oxidation of the leuco compounds of the discharge colors takes place naturally in washing and drying.

MILLING SCARLET 4R CONC.

This is a new scarlet which gives as bright a shade as the ordinary scarlets, but is much faster to milling. It is dyed with the addition of twenty per cent. Glauber's Salt and five per cent. Acetic Acid to the dyebath. The material is entered cool, the dyebath raised to the boil, and the boiling continued for one hour. If necessary, somewhat more Acetic Acid or a small quantity of Oil of Vitriol may be added to exhaust the bath.

To increase the fastness somewhat, after one hour's boiling two per cent. chromium fluoride or one per cent. Bichromate may be added, and the boiling continued for one-half hour.

The presence of metal in the dyebath does not materially affect the shade, although wooden dye-tubs will give the brightest colors. It can be used in compound shades in combination with Acid dyestuffs or Chrome developed colors or Alizarine colors.

Interwoven cotton is not stained, but silk is dyed as heavy as the wool.

The dyeings are fast to light, ordinary milling, washing, pressing, carbonizing, and do not crock. They also stand dry-finishing, dry-heating, and calendering.

It is recommended for all kinds of woolen material on account of the brilliancy of shade and satisfactory fastness.

MILLING BLUE 2R EXTRA.

This is a bright Blue of reddish shade which is fast to moderate milling. It is suitable for dyeing flannels, yarns, and other woolen material. It is dyed in the usual way with twenty pounds Glauber's Salt and five per cent. Oil of Vitriol. The material is entered at 150°, worked up to the boil, and boiling continued for one hour. An after-treatment of either five to ten per cent. Alum or five to ten per cent. Chrome Alum or two to four per

Notes on Processes, New Colors, etc.

cent. Chromium fluoride will increase the fastness to fulling and prevent bleeding.

The shade is not injured by the presence of metal in the dye-bath, therefore no precautions in regard to machinery are necessary.

The interwoven cotton thread is only slightly stained and silk is dyed as deep as the wool.

The dyeings will stand stoving, but in hot drying or pressing the shade becomes somewhat greener.

Milling Blue 2R extra is also recommended for use on shoddy and dark colored materials on account of the brilliancy of the shade and the satisfactory fastness to milling.

CHROMOTROP DW.

This new member of the chromotrop series is recommended on account of not materially changing its shade in milling, washing, and pressing, like the older marks FB and F 4B.

It is dyed in the usual way with 20 per cent. Glauber's Salt and 3 to 4 per cent. Oil of Vitriol. The material is entered at about 120° and brought slowly to the boil and boiled for one hour.

The dyebath is cooled somewhat and bichromate equal to the weight of color used is added. The shade is then developed by another hour's boiling.

If particular fastness to fulling is required, the Lactic Acid method should be used.

Chromotrop DW can be combined with the other after-chrome dyestuffs for the production of compound shades.

In dyeing care should be taken not to use bright copper kettles, and as far as possible the presence of this metal in the dyebath should be avoided. If it is absolutely necessary to use these, some ammonium sulphocyanide should be added to the dyebath.

Interwoven cotton and ordinary silk threads are not stained. The shades are fast to alkali, milling and washing. They are

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also as fast to light as the Alizarine Blues, fast to acid, and fast to carbonizing, and do not crock.

It is recommended for dyeing loose wool, yarn, or piece goods where great fastness is required.

CHROMOGLAUCINE VM Paste, Pat.

This is a mordant color which on account of its fastness is of especial interest in calico printing. As it is stable against reducing agents and only requires a very short steaming for proper fixation, it is particularly suitable for colored discharges and over-printing on Azo colors with naphthol prepared cloth.

In practice the most suitable mordant is green Chromium Acetate, which gives the brightest shades. As a discharging agent for use with it Hydrosulphite NF Hoechst is very suitable. Because of its fastness and quality of ready fixation there is little danger of staining in the process of washing and clearing following the printing.

The proportion of discharging agents is, as usual, based on the depth of shade of the ground and depth of the engraving of the print rollers.

To obtain perfectly even and satisfactory discharges the following precautions are to be taken.

The Paranitraniline Red to be discharged must be perfectly level—that is, the naphthol prepared material must be evenly squeezed and evenly dried. Soap spots or any defects due to irregular handling must be avoided. After printing the goods should be evenly and well dried, and it is best to run them over a small drying cylinder immediately before entering the Mather-Platt quick steamer.

The temperature and time of steaming is the same as usual with Hydrosulphite NF discharges. After steaming the material should be allowed to lie for about an hour so the leuco compound of the color may become oxidized. A passage through weak bichromate solution will hasten the oxidation, but if the goods

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are washed a sufficient length of time this may be omitted. The washing should be followed by a light soaping.

Chromoglaucine VM may be used in combination with other dyestuffs which are not affected by reducing agents, as, for example, Persian Berry extract.

The formulas follow:

DISCHARGE BLUE ON PARANITRANILINE RED.

NAPHTHOL GROUNDING.

15 parts Beta-Naphthol R

30 parts Caustic Soda 22° Bé.

15 parts Para Soap PN

make up for every 1000 parts of liquor.

The padding machine should be regulated so that the goods after passage contain 100 per cent. of the padding liquor—that is, that the weight should be just double of that of the dry material.

The dyebath is made up in the proportion of

14 parts Paranitraniline to

1000 parts

The paranitraniline is diazotized in the usual way. After dyeing the goods should be well washed, soaped, and washed again and dried, and then may be printed with the discharge colors.

DISCHARGE BLUE VM.

50 parts Chromoglaucine VM paste, pat'd.

450 parts Gum Tragacanth 60:1000

50 parts Chromium Acetate (green)

450 parts Hydrosulphite solution

This should make 1000 parts of color.

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HYDROSULPHITE SOLUTION.

- 450 parts Hydrosulphite NF Hoechst is dissolved in
- 425 parts Water, then the water-bath is cooled off and afterwards slowly added:
- 5 parts Formaldehyde 20 per cent.
- 20 parts Acetic Acid 8° Bé.
- 100 parts Water.

After printing the material is well dried and steamed for 4 minutes at 212° to 216° F. in a Mather-Platt machine which is free from air. After lying until the leuco compounds are oxidized, they are then washed, soaped, and dried. If the goods are washed in an open washer, the use of a chromium bath is recommended.

For direct printing the following is used:

- 50 parts Chromoglaurine VM paste, pat'd.
- 250 parts Water
- 400 parts Acid Starch Thickening
- 200 parts Chromium Acetate 20° Bé. (green).

After printing the goods are steamed 5 minutes and washed and finished as usual.

INDIGO VAT MLB FOR WOOL.

This method of dyeing indigo blues on wool has been very successful in a practical way, and when used with proper machinery produces regular results at a very satisfactory cost. The machine here illustrated is easily managed, and the labor cost of handling the material is very low.

Cut No. 1 shows a side view of the machine as it appears ready to begin dyeing. The box A should have a capacity of about 750 gallons, being 100 inches long, 45 inches wide, and 38 inches deep. The depth may be decreased to 32 inches if more convenient. In the box is a basket which is of nearly the same dimensions as the box, arranged with a lift B so that it may be raised above the dye-liquor. This holds the raw stock, and after

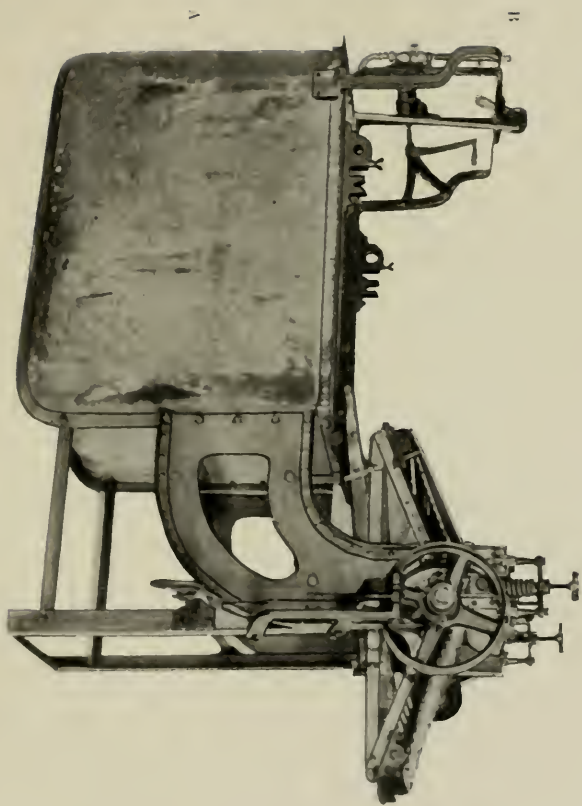
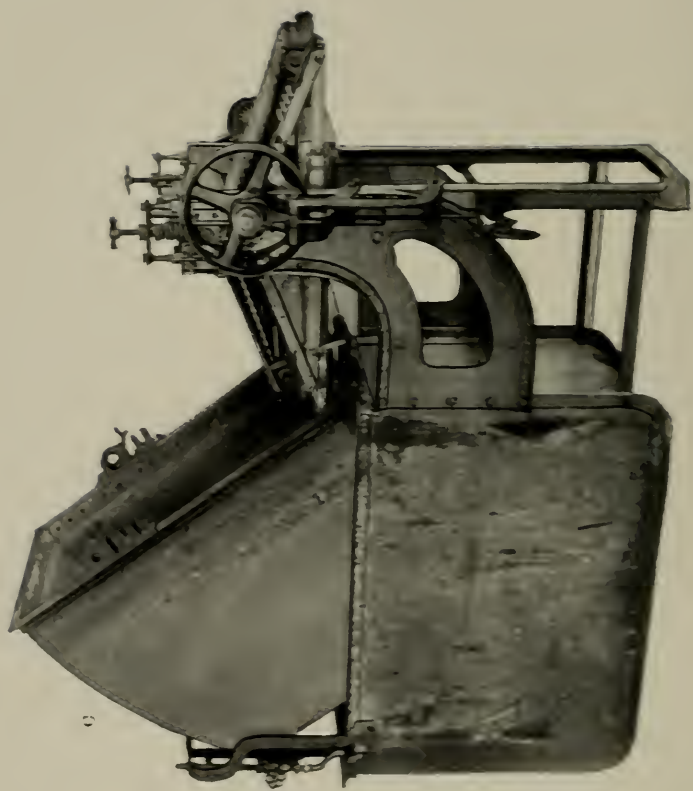
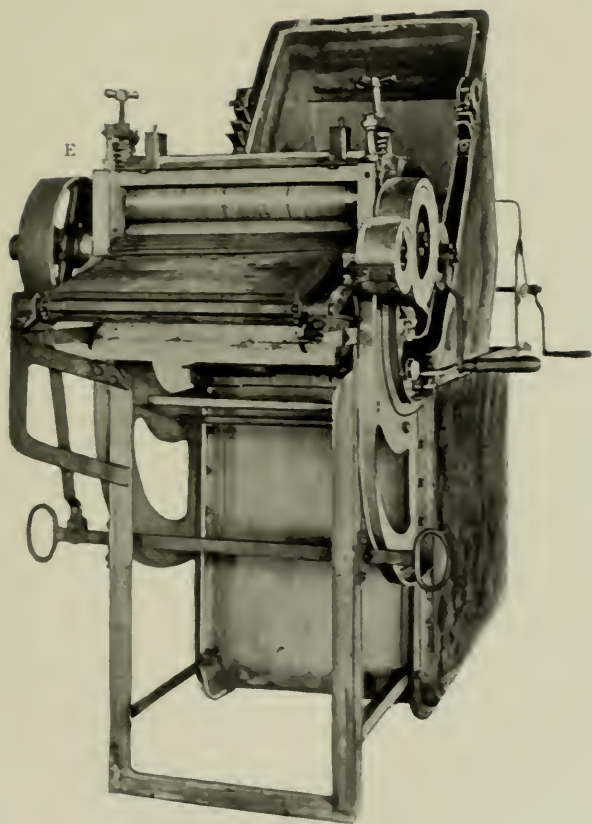


Fig. 1.





CUT 3.

Notes on Processes, New Colors, etc.

dyeing is raised to allow most of the dye-liquor to be drained off before squeezing, as shown in cut No. 2.

In this the basket C has been lifted in front of the squeeze rolls. This enables the stock to be drained and squeezed out with very little exposure to the oxidizing action of the air while it contains an excess of dye-liquor.

The box may be constructed of either iron or wood, but if of the former should be cased in wood to prevent radiation when placed in a cold room. The dye liquor is heated with live steam.

Cut No. 3 shows the arrangement of squeeze rolls and apron for conveying the stock from them to a suitable receptacle. The squeeze rolls E, which are the essential part of the machine, should be of simple construction, with means for strong pressure, and the upper roll should be lapped with slubbing or burlap or covered with rubber. The more thoroughly the excess of liquor is removed the cleaner will be the dyeings.

With a machine of this size a lot of 100 to 125 lbs. of loose wool can be handled for each dip for medium shades; for lighter shades, or if the wool is very long staple, it is necessary to take somewhat less. Therefore in a day of ten hours, giving fifteen to twenty dips, it is possible to turn out about 2000 lbs. of wool. A machine of this design is made by the James Hunter Machine Co., North Adams, Mass., U. S. A.

PREPARATION OF THE DYE-VAT.—The dye-tub should be filled with warm water, heated to 120° to 130° F., and from one to two quarts of ammonia are added until a slight reaction is observed. Then the following are added:

- 2 lbs. Glue dissolved in
- 2½ gallons Water
- 2½ to 2¾ gallons Hydrosulphite O and
- 2½ to 5 gallons Indigo Vat MLBI

The quantity of Indigo Vat to be used is, of course, regulated by the depth of shade required. When the vat is in proper condition, the liquor must have a greenish-yellow appearance and a

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dyed sample should turn green easily when exposed to air; a pure yellow solution is the sign of too much alkali or hydrosulphite; a pure green shows that there is too little.

After the vat is prepared it is stirred a few times and the wool, which has been previously wet out, is entered. The wool should be worked for fifteen to twenty minutes under the surface of the dyebath, taken out, and squeezed.

The wool is then exposed to the air and given a second run in the vat without the addition of any more indigo and again worked for the same time, squeezed out, and exposed. It will be found that the wool absorbs much more indigo on the second run, so that most shades will not require more than two runs for their production.

In dyeing very dark shades of blue, one to two quarts of bisulphide diluted with water should be slowly added to the dye-kettle while the wool is being worked. This has the effect of producing in the vat, which was alkaline at first, a slightly acid reaction. The result of this treatment is that the wool absorbs the greater part of the indigo in the vat (about 80 per cent.). In this way loose wool may be dyed a dark blue in one dip, the shade being regulated by the amount of indigo added. Loose wool, however, being not very clean, it is recommended that it should be dyed in two dips, as the color will come out more level. After the addition of the bisulphite, the proper acidity of the liquor can be recognized by the addition of the bisulphite, the proper acidity of the liquor can be recognized by the addition of one to two drops of phenolphthalein solution to a tumbler of the vat liquor. This should give no red color. After a lot of wool is dyed the vat can be used again, but must be neutralized by the addition of ammonia until a slight alkaline reaction is shown. The phenolphthalein solution is used as above, but in this case should give a faint red color which should soon disappear. If it remains permanent, too much ammonia has been added. After neutralizing, the required amounts of Vat MLB, hydrosulphite, and glue are added and the operation continued as before.

Notes on Processes, New Colors, etc.

The wool should be taken out of the kettle and squeezed as quickly as possible, so that it will not oxidize with an excess of liquor in it. After it has been run through the squeeze, it is allowed to lie in piles until thoroughly oxidized. Two dips are usually sufficient for even the darkest shades. The relative proportions of Indigo Vat MLB, hydrosulphite, and ammonia necessary for the production of the different shades and the appearance and reaction of the vat are shown by the following table:

Shade.	Indigo Vat MLB.	Hydrosulphite.	Ammonia.
Dark Medium Light	Much Equal Little	Little Equal Much	None Little Much

Shade.	Appearance of Liquor.	Reaction with Phenol Phthalein.
Dark Medium Light	Dark Green Green Yellow Green	Trace Alkaline Slightly Alkaline Alkaline

Shade.	Indigo Vat MLB.	Hydrosulphite.	Ammonia.
Dark Medium Light	2½ Gallons 1½ Gallons 1-2 Pints	1½ Gallons. 1½ Gallons. 1 Gallon	..... 1 Pint 3 Pints

The same quantity of glue is used for all shades.

The above is an example of average proportions, which can be varied to suit the particular conditions. The appearance and reaction of the liquor must be carefully observed in judging the proper condition of the vat. The alkalinity is determined by a drop or two of alcoholic phenolphthalein in a test-tube full of the vat liquor. The stronger the red spot formed, the stronger the alkalinity of the vat. When but weakly alkaline, the red

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is very weak and disappears almost immediately, and if the vat is acid, no color will be shown.

The further operation of the hydrosulphite vat is carried out in the same way as the setting. The amount of Indigo Vat MLB naturally depends on the shade desired, for dark shades an addition of about one-half and lighter shades in proportion, down to one-quarter of the amount originally added. After dyeing three or four lots, it will be found that a constant quantity may be used and the shades produced practically without variation. As a coarse wool will exhaust better than a fine wool, the amount of Indigo Vat MLB to be added will naturally be greater in the former case, as with a fine wool more remains in the bath.

The addition of hydrosulphite is about one-half to two-thirds of the first amount without regard to shade. If the vat stands for some time without being used, more hydrosulphite will be necessary than with constant running, and in this case it is advisable to add some hydrosulphite and ammonia at the end of the run, so that the oxidation of the indigo while the vat is out of use will be stopped, and when the dyeing is commenced a less amount of hydrosulphite is necessary. In adding the hydrosulphite and Indigo Vat MLB the best plan is to mix them together and add water at a temperature of about 160° F.

The amount of ammonia depends on the shade desired, and should be regulated by the phenolphthalein test as shown above. Indigo dyes more equally and slowly in the alkaline bath, and therefore the lighter the shade the more ammonia will be required. Dark shades can be dyed without ammonia, and as a rule cannot be obtained in an alkaline vat. While the addition of ammonia is not advisable in starting a vat for dark shades, it may be necessary to add some if the vat has been used for some time, as the decomposition of the hydrosulphite produces an acid reaction.

The addition of gluc is regulated by the length of time the vat is run. If the vat is renewed weekly, the quantity added on starting the vat is sufficient; but in case of longer runs, at the

Notes on Processes, New Colors, etc.

interval of a week, from one to two and one-half gallons of glue solution should be added.

As a rule, after dyeing in the hydrosulphite vat the wool is squeezed out, causing the dirt to be retained in the liquor. Therefore the vat should be renewed more frequently than the fermentation vat. There is no loss in this renewal, as the coloring-matter can be exhausted by running through several lots of wool without further addition of indigo.

INDIGO VAT MLB III IN PRACTICAL OPERATION IN A PRINT-WORKS.

The goods were 64 calicos, to be dyed a medium dark blue for white discharge.

The dyeing was done in an open soaper composed of four boxes transformed for the purpose into a continuous Indigo dyeing machine.

Above the last three boxes or vats a skying arrangement was built to allow the material to oxidize properly before giving another dip. Each box has a capacity of about 125 gallons.

The machine is run at such speed that the goods are immersed about 15 seconds and remain in the air about 1 minute before re-entering the vat. The oxidation of the goods after coming out of the last vat takes place on a truck or in a box.

The four vats being filled, the water is corrected by the addition of 2 lbs. Hydrosulphite C for each box. After five to ten minutes, $6\frac{1}{4}$ gallons stock liquor are added to each. A few minutes after the introduction of the stock liquor, if the four vats are in proper condition, the liquid will have a clear greenish-yellow appearance. Should the liquor appear too green, the addition of about 1 lb. or 2 lbs. of hydrosulphite in each box will bring them in shape. The dyeing can then be started.

While the dyeing is going on, stock liquor should be added in small quantities at regular intervals. This is absolutely necessary, as the vats being small, they will exhaust very rapidly and

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if not carefully watched too great difference in shade will appear on the goods. A too large amount of stock liquor added at one time will also be detrimental to the uniformity of the dyeing.

The stock liquor is made up as follows:

Indigo vat MLB III 25% paste.....	52 lbs.
Caustic soda 66° Tw.	5 gallons
Hydrosulphite	5 gallons
Total	25 gallons

Stir very gently while mixing these products in order to prevent oxidation as much as possible.

The best results were obtained by the addition of $\frac{1}{2}$ gallon stock liquor every one-half hour to each vat, or 4 gallons per hour in all. The stock liquor for feeding is introduced from small kegs gauged for the purpose, which is done while running the goods. This stock liquor is prepared with the same quantities of Indigo Vat MLB III and Hydrosulphite C, but 3 gallons of Caustic Soda are used instead of 5.

One run through the machine gives a light blue, two runs produce a dark medium blue. It takes one hour to make one run of 50 pieces of 56 yards each or two hours to obtain a heavy shade. Pieces weigh 6 lbs. each.

Below are the quantities of Hydrosulphite and stock liquor used every day and the number of pieces dyed:

	Stock.	Hydrosulphite	Pieces.
Monday	8 gallons	8 gallons	50
Tuesday	16 gallons	5 gallons	100
Wednesday	20½ gallons	4½ gallons	150
Thursday	17 gallons	3 gallons	100
Friday	14¾ gallons	2¾ gallons	100

Notes on Processes, New Colors, etc.

The $6\frac{1}{4}$ gallons stock liquor introduced in each box at the start are not figured in, as they are supposed to remain as long as the vat is in use.

The main object is to keep the vat well reduced in order to obtain the best results in regard to regularity of production and quality, as constant use of a small-sized vat from morning till night will oxidize it very rapidly; it is therefore a good plan to stop the dyeing for an hour during the day in order to allow the Indigo to reduce again. This is done by the addition of a small quantity of Hydrosulphite and also a very small quantity of Caustic Soda.

Caustic Soda.—Care should be exercised in the use of this product. Too much of it will tend to destroy the keeping qualities of the vat, and if too little is used the Hydrosulphite will not act as it should.

Compared with the Bisulphite Vat, the machinery used with this Vat has the advantage of occupying less space than the ordinary Indigo dyeing plant. The vats being smaller, less Indigo is required to stock them. It can be used in large dye-houses as well as in places where Indigo dyeing is not carried on the whole year. It is a perfectly clean vat, entirely free from sediment.



PART V

Educational



Educational

MISSISSIPPI TEXTILE SCHOOL.

Department of Chemistry and Dyeing.

PROF. L. CHARLES RAIFORD IN CHARGE.

The Department of Chemistry and Dyeing of the Mississippi Textile School has completed its second year of successful work. During the past year the equipment has been increased and the curriculum broadened. Besides the work which is required of all regular students of the School, this department has now arranged to offer to those who already have the knowledge included in a general education a special course dealing only with the subjects of chemistry and dyeing, to which the student will devote his entire time for two years.

In order to accommodate the extra courses offered by this department, it has been decided to build an annex to the main building now occupied by the School. This is now in process of construction, and will be occupied by the end of the present year.

The description of subjects given below will indicate the nature of the work now offered by this department.

COURSES OF INSTRUCTION.

CHEMISTRY.

1. Descriptive Chemistry. Six hours. Through the year. Required of all Sophomores and of those who pursue the special course offered by this department.

Non-metals; metals, their metallurgy, compounds and practical application; theoretical chemistry. Lectures with experiments, written exercises, and individual laboratory work.

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2. Qualitative Analysis. Seven hours. First Term. Required of all Juniors and of those who pursue the special course offered by this department. In the special course the time will be increased to twelve hours.

An introduction to the subject of analytical chemistry, including the classification of metals, the characteristic tests used for their separation from certain of their compounds, a study of the principal non-metals and the acids formed by them; the method of separation and recognition of acids and acid radicals, and the qualitative analysis of the salts representing the bases and acids that have been studied; writing equations and the calculation of results. Chiefly laboratory work.

3. Quantitative Analysis. Seven hours. Second Term. Required of all Juniors and of those who pursue the special course offered by this department. In the special course the time will be increased to twelve hours.

Study of the quantitative precipitation and separation of certain representative elements and compounds; a discussion of the principles according to which quantitative determinations are made, including the theory of the chemical balance, the use of burettes, graduated flasks, etc., consideration of the relative merits of the different systems of weights and measures. Lectures, written exercises, and laboratory work.

4. Quantitative Analysis, continued. Twelve hours. Third Term. Required of those who pursue the special course offered by this department. Elective for Graduates who have passed in courses 1-3.

An examination of the purity of certain commercial products used in textile establishments, including soda ash, bleaching powder, sulphides, nitrites, bichromates, etc. Chiefly laboratory work.

5. Organic Chemistry. Seven hours. Third Term. Required of all Juniors and of those who pursue the special course offered by this department. In the special course the time will be increased to twelve hours.

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A general course consisting of graded exercises in the preparation and testing of carbon compounds of the fatty series, so selected as fairly to represent the characteristic differences between the various classes of compounds grouped under this head. Lectures, recitations, and laboratory work.

6. Organic Chemistry, continued. Twelve hours. Through the year. Elective for those who pursue the special course offered by this department, and for Graduates who have passed in courses 1-5.

An extended study of aromatic compounds so arranged as to illustrate the methods made use of in the separation from coal-tar and purification of the mother substances and intermediate products from which the synthetic coloring-matters are obtained; the preparation of samples of typical colors belonging to the acid, basic, mordant, and direct classes. Lectures and laboratory work.

7. Industrial Chemistry. Twelve hours. Through the year. Required of those who pursue the special course offered by this department. Elective for approved Graduates.

A consideration of the principles of chemistry as applied in the various manufacturing processes, with special reference to those having to do with the operations carried on in textile establishments. Lectures and laboratory work.

8. Inorganic Preparations. Twelve hours. First and Second Terms. Elective for those who pursue the special course offered by this department, and for Graduates who have passed in courses 1-5.

A course dealing with the preparation of chemically pure salts, including the requirements for laboratory reagents in general. Lectures and Laboratory work.

9. Technical Analysis. Twelve hours. Through the year. Required of those who pursue the special course offered by this department. Elective for approved Graduates.

An advanced course dealing with the composition and determination of purity of various mixtures and compounds used in the bleachery and dye-house. The subjects offered include the

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analysis of water, fuels, oils, soaps, bleaching materials, mordants, dyes, etc., and may vary with the needs of the individual students. Conferences, reports, and laboratory work.

DYEING.

1. Dyeing of Textile Fabrics, experimental. Eight hours. Through the year. Required of all Seniors and of those who pursue the special course offered by this department. In the special course the time will be increased to twelve hours.

A general course dealing with the behavior of fibres towards reagents, bleaching of cotton, the theories of dyeing, the application of substantive, basic, mordant, and insoluble dyes to cotton; the mixing of colors for the production of compound shades; color matching. Lectures, written exercises, and laboratory work.

2. Dyeing of Textile Fabrics, practical. Twelve hours. First and Second Terms. Required of those who pursue the special course offered by this department. Elective for approved Graduates.

Practical application, with commercial apparatus, of the principles demonstrated under the head of course 1. Chiefly laboratory work.

3. Calico Printing. Twelve hours. Third Term. Required of those who pursue the special course offered by this department. Elective for approved Graduates.

An experimental study of the principles of calico printing as illustrated in the production of direct, mordant, discharge, and resist styles of work. Chiefly laboratory work.

EQUIPMENT.

The work in chemistry and dyeing is carried on in an experimental laboratory for chemistry, an experimental laboratory for dyeing, and a practical dye-house. Adjacent are a lecture-room, a balance-room and the instructor's office and laboratory. In addition to these there is now a collection of books and periodicals

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which will be used hereafter as a departmental library for reference in connection with the work in chemistry and dyeing. The collection includes many of the most important books on the subjects indicated, while several of the leading American and foreign journals are regularly received.

The special course in Chemistry and Dyeing, extending over two years, has been arranged according to the previous preparation of the student. The outline given below presupposes a knowledge of elementary descriptive chemistry.

First Year—First Term.

2. Qualitative Analysis.
6. Organic Chemistry, or 8. Inorganic Preparations.
7. Industrial Chemistry.

Second Term.

3. Quantitative Analysis.
6. Organic Chemistry, or 8. Inorganic Preparations.
7. Industrial Chemistry.

Third Term.

4. Quantitative Analysis, advanced.
6. Organic Chemistry, or 5. Organic Chemistry.
7. Industrial Chemistry.

Second Year—First Term.

1. Dyeing, experimental.
9. Technical Analysis, or 6. Organic Chemistry.
2. Dyeing, practical.

Second Term.

1. Dyeing, experimental.
9. Technical Analysis, or 6. Organic Chemistry.
2. Dyeing, practical.

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Third Term.

1. Dyeing, experimental.
9. Technical Analysis, or 6. Organic Chemistry.
3. Calico Printing.

NEW BEDFORD TEXTILE SCHOOL.

The principal addition made to the curriculum of the school during the present year has been the establishment of a Mechanical Department, which was instituted at the beginning of the school year.

The large room situated at the northwest corner of the third floor of the main building is used as a mechanical drawing-room, while the classroom just east of this room is used as a lecture- and recitation-room. The subjects taught include Mechanics, Mechanical Drawing, and Steam and Electrical Engineering. No arrangements have as yet been made to give special courses in Mechanics; this department at present being simply an adjunct to the other departments of Cotton Manufacturing and Knitting; the students taking the manufacturing courses devoting certain hours of the week to Mechanics and Drawing.

This department is in charge of Mr. George L. Colburn, who comes to this school from the Mechanics Institute, Rochester, N. Y., where he was engaged as instructor of Machine Work and Mechanical Drawing. Mr. Colburn was also engaged for two years as instructor in Mechanical Drawing, Woodwork, and Forging at the Toledo Manual Training School of Toledo, Ohio; and three years as instructor of Mechanical Drawing at the Central Manual Training School of Cleveland, Ohio. He is a graduate of Purdue University. His wide experience has especially fitted him for the work that he has taken up with the New Bedford Textile School, while the interest already shown in the department has fully justified the trustees in its establishment.

Manufacturers have been very liberal in helping to equip this department of the school, and many fine models of different

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mechanical and electrical appliances have been installed for the use of the students. It is aimed to make this department thoroughly up to date in every respect, and thoroughly representative of the school.

DEPARTMENT OF CHEMISTRY AND DYEING.

The various courses offered in Chemistry and the applications of Dyestuffs are so arranged that students may enroll with the idea of becoming a Textile Chemist or Colorist, devoting their entire time for the period of two years to the work in this department, or students enrolled in other courses may take the subjects included in the Chemistry and Dyeing course, with the exception of Organic Chemistry and the preparation of a thesis.

The following subjects are included in the complete course:

General Chemistry.

Qualitative Analysis.

Quantitative Analysis.

Organic Chemistry and the Application of Dyestuffs.

Every student who is to graduate from the course in Chemistry and Dyeing must devote twelve hours per week during the last half of his second year to original work, and at least one week before graduation must submit to the principal of the department a thesis of not less than two thousand words, based upon the results of his own investigations.

The time spent on the study of the application of dyestuffs has been increased to three terms, the following topics being included in the complete course.

DYEING.

Dyers' materials; textile fibres; properties of the textile fibres; action of the various reagents on textile fibres; quantitative estimation of cotton and wool in unions and shoddy; cotton, wool, and silk in mixtures; cotton and linen, etc. The more important

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inorganic materials used in bleaching and dyeing, including mordants, assistants, weighting materials, cleansing, scouring, and bleaching agents, etc. The more important organic substances, organic acids and salts; tanning materials; derivatives of the fats, soaps, soluble oils, starches, dextrine, etc.

Water.—Essential qualities for technical purposes; effect of impurities in bleaching and dyeing; detection of impurities and methods for correction.

Bleaching Cotton.—Method by means of chloride of lime and other hypochlorites; bleaching with sodium peroxide and hydrogen peroxide; methods of preparing cotton preliminary to dyeing.

Theory of Dyeing.—The chemical and mechanical theories; classification of dyestuffs with regard to their application; substantive, basic, and acid dyes; alizarine and mordant dyes; paranitraniline red, oxidation black, and similar colors produced direct on the fibre, natural dye products.

Dyeing of Cotton.—Application of the direct cotton colors; colors that may be diazotized and developed; colors subject to after-treatment; sulphur colors; colors that may be coupled with diazotized paranitraniline.

Dyeing cotton yarns; cotton piece goods in the vat; on the jigger, in the Foulard or padding machine; raw stock; dyeing cotton warps; continuous dyeing machines; mechanical dyeing; dyeing on cops, etc.; mordanting cotton; difficulties experienced in mordanting; dyeing mordanted cotton with basic dyes; application of alizarine dyes on iron, alumina, and chromium mordants; application of dyes of the eosin group to cotton; padding with acid dyes and dyes of the phthalein group.

Bleaching of Wool.—Use of sulphurous acid; sodium bisulphites and hydrosulphite compounds; method by means of peroxides; bleaching with potassium permanganate; carbonization before and after dyeing; use of sulphuric acid; chloride of alumina and magnesium chloride; bleaching silk and mixtures of cotton, linen, wool, and silk.

Stripping.—Use of hydrosulphites, oxalic acid, sulphuric acid,

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and potassium dichromate; scouring wool and methods of preparing wool and unions preparatory to dyeing.

Wool Dyeing.—The application of the acid dyes; alizarine dyes; natural dyes; basic and substantive dyes; dyeing in an acid bath; dyeing in a neutral bath; dyeing in an alkaline bath; dyeing phthalein colors with tartar, alum, and acetic acid; mordanting wool with alumina and chrome.

Application of the Alizarine Dyes to Wool.—Dyeing in an acid bath and after treating with metallic salts; apparatus for dyeing raw stock; slubbing, yarn and piece goods.

Silk Dyeing.—The dyeing of union goods; study of the relative affinity in the same bath of cotton and wool fibres for the dyestuffs used in dyeing unions; the one-bath method; the two-bath process; the several bath process; production of two-colored effects by the one-bath process; the two-bath and several bath processes for shot effects; apparatus used for dyeing union piece goods.

Dyeing unions of cotton and silk; wool and silk, etc.

Matching Shades.—Matching given shades on cotton, wool, silk, and union goods; matching on various materials to meet special requirements as regards fastness, price, etc.

Dye Testing.—Testing for strength, shade, and levelling power; testing mixtures of dyestuffs and determining impurities; matching one dyestuff with mixtures of others; methods for the identification of dyestuffs both in the powder form and on the dyed fabric.

Special Methods for Dyeing.—Production of aniline and similar colors on the fibre; production of aniline or oxidation black; the application of indigo; the hydrosulphite vat; the iron-sulphate lime vat; the zinc dust lime vat.

Mercerizing Cotton.—Mercerizing machines dyeing mercerized cotton.

Calico Printing.—Theory; methods of preparations of the various printing pastes; thickening agents, mordants, and assistants; study of the efficiency of the various discharges; produc-

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tion of the various styles; direct styles; mordant styles; steam, resist, and discharge styles.

In the new building which is soon to be erected by the school it is proposed to equip a complete dye-house in addition to the present dyeing laboratory, the raw stock, yarn, and other materials dyed to be used in the carding, spinning, and weaving departments.

LOWELL TEXTILE SCHOOL.

During the past year numerous additions have been made to the equipment of the Chemistry and Dyeing department of this institution. The facilities for practical dyeing have been greatly increased, and it is now possible to dye all the raw stock, yarn, and cloth made and used in the school.

Many additions have also been made to the curriculum. The work in color-matching and shading has been both extended and improved. The study of the dyeing of fabrics has received more attention, as well as the work in Textile printing.

Investigations of the following subjects have been conducted or are at present under consideration.

Chromium Mordanting of Wool.

Lactic Acid in Calico Printing.

Flavanthrene and Indanthrene.

Chemical Composition of Various Wools.

Formic Acid and its Application in Textile Coloring.

Methods for determining the Oxidation Stage of Logwood.

The instructing Staff of the department remains as last year.

THE PHILADELPHIA TEXTILE SCHOOL.

The Chemical and Dyeing Department of the Philadelphia Textile School has this year enlarged the scope of its work by the addition of a third year to the courses in chemistry and dyeing. Dr. Matthews, the professor in charge of the department, after a careful investigation of the methods of study and the courses of



Lowell Textile School.

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instruction given in the foremost technical schools of Europe, has so modelled the instruction given in the different subjects of study that the most practical results are attained by the student, while at the same time he becomes drilled in the scientific method of study and investigation.

The following outline presents the curriculum of the Department of Chemistry and Dyeing.

First Year—First Term.

Chemistry I.—General Inorganic. (4 hrs. lectures, 10 hrs. laboratory, per week.)

Dyeing I.—Physical and Chemical Properties of the Textile Fibres. (1 hr. lecture, 3 hrs. labor, per week.)

Dyeing II.—Scouring and Bleaching. (1 hr. lecture, 4 hrs. labor, per week.)

Dyeing III.—Acid and Basic Dyes. (1 hr. lecture, 9 hrs. labor, per week.)

First Year—Second Term.

Chemistry II.—Qualitative Analysis. (4 hrs. lectures, 10 hrs. labor, per week.)

Dyeing IV.—Substantive and Mordant Dyes. (1 hr. lecture, 8 hrs. labor, per week.)

Dyeing V.—Principles of Shade Compounding and Matching. (1 hr. lecture, 9 hrs. labor, per week.)

Second Year—First Term.

Chemistry IIIa.—Quantitative Analysis; Gravimetric. (2 hrs. lectures, labor, per week.)

Chemistry IV.—Organic Chemistry. (3 hrs. lectures, 5 hrs. laboratory, per week.)

Chemistry V.—Industrial Chemistry. (1 hr. lecture per week.)

Chemistry VI.—Chemical Arithmetic; Physical Constants and Calculations. (1 hr. lecture per week.)

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Chemistry XIa.—Textile Chemistry; Analysis of Fibres, Yarns, and Fabrics. (1 hr. lecture, 4 hrs. labor, per week.)

Dyeing VI.—Color Mixing and Spectroscopy. (1 hr. lecture, 2 hours labor, per week.)

Second Year—Second Term.

Chemistry IIIb.—Quantitative Analysis; Volumetric. (1 hr. lecture, 9 hrs. labor, per week.)

Chemistry IV.—Organic Chemistry. (3 hrs. lectures, 5 hrs. labor, per week.)

Chemistry V.—Industrial Chemistry. (1 hr. lecture per week.)

Chemistry XIb.—Textile Chemistry; Analysis of Dyestuffs and Mordants. (1 hr. lecture, 2 hrs. labor, per week.)

Dyeing VII.—Sulphur Dyes; Developed Dyes; Aniline Black; Indigo; Turkey Red. (1 hr. lecture, 4 hrs. labor, per week.)

Dyeing VIII.—Dyeing, Loose Stock, Tops; Warps; Cops; Cloth Dyeing. (1 hr. lecture, 2 hrs. labor, per week.)

Chemistry VIII.—Technical Seminar. (3 hrs. per week.)

Third Year—First Term.

Chemistry VII.—Technical Analysis. (1 hr. lecture, 8 hrs. labor, per week.)

Chemistry IX.—Principles of Organic Synthesis. (1 hr. lecture, 4 hrs. labor, per week.)

Chemistry XIc.—Textile Chemistry; Testing Dyestuff Reactions and Adulterations. (1 hr. lecture, 2 hrs. labor, per week.)

Dyeing IX.—Mineral Dyes and the Natural Dye Woods. (1 hr. lecture, 2 hrs. labor, per week.)

Dyeing X.—Silk Dyeing and Weighting. (1 hr. lecture, 2 hrs. labor, per week.)

Dyeing XI.—Mercerizing and Dyeing Mercerized Cotton. (1 hr. lecture, 2 hrs. labor, per week.)

Dyeing VII.—Textile Printing. (1 hr. lecture, 6 hrs. labor, per week.)

Chemistry VIII.—Technical Seminar. (3 hrs. per week.)

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Third Year—Second Term.

Chemistry VII.—Technical Analysis. (1 hr. lecture, 6 hrs. labor, per week.)

Chemistry X.—Chemistry of Dyestuffs. (1 hr. lecture, 3 hrs. labor, per week.)

Chemistry XI d.—Textile Chemistry; Testing Dyes for Fastness and their Reactions on the Fibre. (1 hr. lecture, 2 hrs. labor, per week.)

Dyeing XII.—Textile Printing. (1 hr. lecture, 6 hrs. labor, per week.)

Dyeing XIII.—Preparation and Dyeing of Chlored Wood; Artificial Silk; Paper; Leather; Preparation of Lake Pigments. (1 hr. lecture, 2 hrs. labor, per week.)

Dyeing X.V.—Dyeing Union Goods; Satin; Gloria. (1 hr. lecture, 2 hrs. labor, per week.)

Dyeing XV.—Dyeing Linen; Jute; Ramie; Ombre and Novelty Dyeing. (1 hr. lecture, 2 hrs. labor, per week.)

Chemistry VIII.—Technical Seminar. (3 hrs. per week.)

CHEMISTRY I.—GENERAL INORGANIC.

The general properties of matter. Simple and compound bodies. Laws of chemical combination. Elements, atoms, and molecules. The atomic theory. Chemical calculations. Preparation, classification, and chemical behavior of the chief elements and their compounds, comprising the non-metal and metals, with special reference to those of commercial importance.

This course is elementary, and is carried on by means of lectures and recitations, coupled with considerable laboratory work in experimentation on the properties and preparation of the chemical elements and their compounds.

TEXT-BOOKS.—Williams's Elementary Chemistry; Whiteley's Chemical Calculations; Newell's Descriptive Chemistry; Harold's Chemical Experiments.

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CHEMISTRY II.—QUALITATIVE ANALYSIS.

The analytical classification of the metals. Characteristic tests for the different elements. Detection of bases and acids in their compounds. Solving of analytical problems. Writing of reactions and calculation of results. Laboratory practice in the manipulation of experiments and the handling of analytical apparatus.

This course is arranged with the view of making the student thoroughly familiar with the characteristic reactions whereby the different chemical elements may be recognized and distinguished from one another in their numerous combinations. This course is carried on largely by experiment, and the student is required to solve problems given to him for analysis. He is taught how to test materials with regard to purity and the methods of detecting adulterations in the various commercial products with which he is apt to come in contact.

TEXT-BOOK.—Newth's Manual of Chemical Analysis.

CHEMISTRY IIIA.—QUANTITATIVE ANALYSIS; GRAVIMETRIC.

General procedure in analytical methods; sources of error and their prevention. Preliminary manipulations; use of analytical balances. Estimation of water of crystallization; preparation of pure salts. Methods of precipitation and treatment of precipitates. Typical gravimetric analysis of the metals; aluminum, chromium, iron, calcium, copper, lead, etc. Analyses of compounds containing several metals. Gravimetric estimation of the acid radicals; sulphuric acid, chlorine, carbon dioxide, etc. Exercises in the analyses of alloys, minerals, etc. Principles of electrolytic analysis.

In the course the student learns, by means of actual demonstration, the methods of determining quantitatively the composition of various chemical compounds. He is well drilled in the use of the balance, and is taught habits of precision, accuracy of observation, and delicacy of manipulation, so necessary for success in chemical analysis. The objects employed for the analysis,

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as far as possible, are selected from commercial products, and are those best adapted to the immediate needs of the individual student.

CHEMISTRY IIIB.—QUANTITATIVE ANALYSIS; VOLUMETRIC.

General principles of volumetric procedure. Classification of volumetric methods. Use and limitations of indicators. Alkalimetry and acidimetry; typical analyses of acids and alkalies. Volumetric methods by oxidation and reduction; use of potassium permanganate, potassium bichromate, and iodine solutions. Valuation of bleaching powder, iron ores, etc. Volumetric methods of precipitation; water analysis. Gas analysis; principles and general methods; typical analyses. Analysis of carbon compounds by combustion; exercises on commercial products.

This course is a continuation of the preceding, and the student carries his analytical work on into the study of volumetric methods. The subject is conducted on as practical lines as possible, and the briefer commercial methods are given wherever advisable. The broad chemical principles, however, on which the entire subject is based is constantly held before the attention of the student, and he is required to thoroughly understand all the reactions taking place in the course of his experiments.

CHEMISTRY IV.—ORGANIC CHEMISTRY.

General properties of the compounds of carbon. Recognition and estimation of carbon, hydrogen, oxygen, nitrogen, the halogens, sulphur, and phosphorus in organic bodies. Calculation of percentage composition and molecular formula. Classification of organic compounds. The aliphatic series, the hydrocarbons; halogen derivatives; alcohols; ethers; aldehydes; ketones; the fatty acids, and their derivatives. The theory of organic radicals. Study of the esters, sulphur compounds; amines and cyanogen compounds; metallic compounds. The unsaturated hydrocarbons

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and their derivatives. The carbohydrates and dibasic acids and alcohols. Nitrogenous and proteid substances. The aromatic compounds; benzine and its analogues. The aromatic nitro and amido compounds. Diazo and azo compounds. The aromatic acids and their derivatives. Triphenylmethane derivatives. Naphthalene and its compounds. Anthracene and its compounds. Heterocyclic compounds; the alkaloids.

This course is elementary in character, and is adapted to the needs of the student who is desirous of pursuing further the study of dyestuffs from a chemical point of view. He is made familiar with the names, the composition, and the methods of preparation of the more important compounds of organic chemistry. The analysis and synthesis of a few typical bodies is undertaken with the view of illustrating the methods of building up artificially the numerous derivatives of carbon which find such an extended application in the manufacturing industries.

TEXT-BOOKS.—Remson's Organic Chemistry; Cohn's Theoretical Organic Chemistry; Cohn's Practical Organic Chemistry.

CHEMISTRY V.—INDUSTRIAL CHEMISTRY.

Industrial processes in chemical manufacture. Fuels; water. Sulphur and its compounds; technology of sulphuric acid. Salt and hydrochloric acid. The Soda industries. The chlorine industry and chlorine compounds, bleaching agents. The nitric acid, ammonia, and potash industries. Fertilizers; cements and glass. Ceramic industry. Pigments. Minor chemical preparations; peroxides, oxygen, and sulphates; cyanides; permanganates. The organic industries. The destructive distillation of wood, bones, and coal. Mineral oils. Vegetable and animal oils, fats, and waxes. Soap, candles, and glycerin. Resin and gums. Starch, dextrine, and glucose; sugar. The fermentation industries. Explosives. The textile industries: fibres, bleaching, mordants; dyestuffs; dyeing; printing. Paper and leather industries. Glue.

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This course is based on text-book study, supplemented wherever necessary by lectures. The study is conducted by a set of quiz questions, to be systematically studied up and answered. Outside and supplementary reading on special topics under discussion is recommended. The course is for the purpose of giving the student a good general idea of the various industries which depend primarily upon chemistry for their existence.

A number of industrial establishments will be visited by the students to afford them a means of observing the manufacture of chemical products.

TEXT-BOOKS.—Thorp's Outlines of Industrial Chemistry.

CHEMISTRY VI.—CHEMICAL ARITHMETIC: PHYSICAL CONSTANTS AND CALCULATIONS.

Calculations of mass, density, and weight. Gas and fluid pressure. Thermometry and barometry. Chemical formulas, molecular weight and percentage composition. Chemical equations. Calculations concerning heat changes. Strength of solutions; hydrometry. Calculations relating to the dye-house and mill, and to technical chemistry in general. Calculation of analytical results. Calculation relating to physical measurements of a practical value in technical chemistry.

This course is for the purpose of making the student familiar with the different methods employed in chemical calculations, and the practical application of the same to the needs of his daily experience. The technical problems relating mostly to mill practice will be the kind chiefly dealt with.

CHEMISTRY VII.—TECHNICAL ANALYSIS.

The analysis and valuation of commercial articles occurring in the dye-house and mill. Acids, alkalies, bleaching agents, soaps, oils, tannins, mordants, and dyeing and scouring materials. Analysis of water for industrial purposes. Analysis of finishing materials. Systematic qualitative examination of finishing

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agents. Organic materials used in finishing; grape sugar, cane sugar, glycerine, starch, dextrine, gums, vegetable mucilages, gelatine, albumen; fats, oils and waxes; mineral oils, soaps, resins. Classification of tests and reagents used in examination of finishing materials.

This course offers to the student a means of becoming acquainted with chemical technology and the methods of analyzing, and the valuation of commercial products. The chemical processes underlying their manufacture and application is carefully studied with reference to the needs of the student himself. A considerable number of technical analyses must be completed by each student under the guide and direction of the instructor in charge.

CHEMISTRY VIII.—TECHNICAL SEMINAR.

Weekly reading and discussion of papers containing abstracts of articles appearing in the different scientific and technical journals. Practice in the reviewing of the literature relative to new processes in chemistry, dyeing, printing, etc.

This course is intended to develop in the student a systematic study of the current scientific literature, and to enable him to intelligently abstract therefrom the information most adapted to his needs. It is also for the purpose of cultivating the instinct of research, which is such a necessity for the successful pursuit of any science at the present time. This course familiarizes the student with the most advanced work of the leading investigators of the day, and shows him the world-wide importance of his own school studies.

The library of the school possesses a very complete assortment of both foreign and domestic scientific and technical journals, which are available for the use of the students.

The *Dyers' Trade Journal* offers a prize of a chemical balance to the students presenting the best seminar work throughout the year.

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CHEMISTRY IX.—PRINCIPLES OF ORGANIC SYNTHESIS.

Methods of oxidation of different organic groups. Chemicals and agencies employed for oxidizing. Direct and indirect oxidations. Studies in reductions; action of reducing agents; elimination of radicals. Laws of substitution and the interchange of radicals. Exercises in the synthesis of various classes of derivatives. Direct fixation of organic radicals. Molecular decompositions. Formation of esters and ammonia derivatives. Synthesis of complex groups, polymerides, and insomerides.

This course forms a continuation of the elementary study of organic chemistry, and is intended to familiarize the student with the general methods of that comprehensive subject. The study is developed in a complete set of lectures, followed by considerable practical work in the synthesis of various organic derivatives. This work is given more especially for the benefit of those students who are looking forward to the more advanced study of organic chemistry in the lines of dyestuff manufacture and research.

CHEMISTRY X.—CHEMISTRY OF DYESTUFFS.

Coal-tar and the products obtained by its distillation. The nitro-dyes; raw materials used and methods of manufacture. The azo-dyes; study of the different bases employed; methods of diazotizing and coupling; naphthol and naphthylamine derivatives; sulphuric acid compounds. The other classes of dyes with nitrogen chromophors. Anthracene dyes; the alizarines. Artificial indigo and its methods of manufacture. The sulphur dyes. Chemistry of the coloring principles in the natural dye-woods.

The object of this course is to give the student some idea of the chemical principles underlying the manufacture of dyestuffs. Before this study can be pursued, a fair knowledge of organic chemistry must be acquired. The technology and chemistry of the coal-tar colors will be studied in a course of lectures, sup-

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plemented by considerable experimental work in the laboratory, in which the student will be given the opportunity of many of the intermediate compounds and dyestuffs.

TEXT-BOOK.—Allen's Commercial Organic Analysis. Vol. iii., Part I. (Edition Matthews.)

CHEMISTRY XIa.—TEXTILE CHEMISTRY, CHEMICAL ANALYSIS OF FIBRES, YARNS, AND FABRICS.

Analysis of mixed yarns and fabrics, consisting of wool, silk, cotton, linen, artificial silk, etc. Distinction between Tussal and mulberry silk. Conditioning of textile materials. Determination of sizing and estimation of oil and grease in fabrics. Detection of mineral oil and rosin in fabrics and yarns. Estimation of mineral matters in fabrics.

CHEMISTRY XIb.—TEXTILE CHEMISTRY; ANALYSIS OF DYE-STUFFS AND MORDANTS.

Determination of the nature and estimation of the amount of mordants on wool and cotton fabrics. Determination of the nature of the sizings and other ingredients in fabrics. Determination of exhaustion of dye-baths and mordant baths. Investigation of the proper amounts of mordants and assistants to use in dyeing.

CHEMISTRY XIc.—TEXTILE CHEMISTRY; REACTIONS OF DYE-STUFFS AND ADULTERANTS.

Testing the chemical reactions of dyestuffs. Solubility in various liquids. Reactions with acids, alkalies, tannin reagent, metallic salts, oxidizing and reducing agents. Identification and estimation of adulterants in dyestuffs. Determination of proper classification of dyestuffs.

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CHEMISTRY XI^d.—TEXTILE CHEMISTRY; TESTING FASTNESS OF DYES AND THEIR REACTIONS ON THE FIBRE.

Capillary speed of dyestuffs; detection of mixed dyes. Testing fastness of dyes to light, washing, fulling, crocking, water, weather, acids and carbonizing, perspiration, alkalies, lime and street dust, stoving, steaming, chloring, etc. Adaptability of dyestuffs to different classes of goods. Testing of dyestuffs on the fibre for purposes of identification. Practice in the analysis of dyes in bulk and on the fibre.

The subject of textile chemistry is a very comprehensive one, and for that reason is divided into four groups, one-half year (a term) being devoted to the study of each group. This course is very essential to the student who desires to fit himself thoroughly for the position of dyer, chemist in a textile mill or commission house, or chemist in a dyestuff manufactory, and has been specially designed with these ends in view. A large amount of practical work in the analysis and testing of the various materials given is required of each student, and at the same time he is thoroughly drilled in the chemical principles involved, that he may understand clearly each step taken.

DYEING I.—PHYSICAL AND CHEMICAL PROPERTIES OF THE TEXTILE FIBRE.

Behavior of the fibres towards heat and water. Action of acids, alkalies, and metallic salts. Action of mordants and dyestuffs. Chemical composition of the fibres and methods of testing the same. Measurement of the tensile strength, elasticity, diameter, and length of the staple of the different fibres. Microscopy of the fibres; study of their structure. Recognition and testing of the fibres by means of the microscope. Microchemical reactions.

This course is intended to make the student familiar with the various fibres that are employed for textile purposes. He is required to make a number of micrographs of typical fibres, and

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in this manner study with microscopic accuracy the peculiar structure of fibres of different origin. Experiments are conducted on the action of various physical and chemical agencies to which the fibres are liable to be subjected, and the influence of the same on the strength and quality of the fibres is carefully noted. The student is also made familiar with the use of the microscope and other testing apparatus. A thorough course of lectures is given to supplement the experimental part.

TEXT-BOOK.—Matthews's "Textile Fibres."

DYEING II.—SCOURING AND BLEACHING.

Function of wool scouring. Study of the impurities occurring in raw wool. Steeping and scouring wool; use of alkalies and soaps. By-products from scouring liquors. Scouring cloth and yarn. Testing of water for scouring purposes. Study of the solvent methods for scouring wool. Testing of soaps for scouring purposes; action of hard water. Influence of different scouring agents and conditions on the physical properties of wool. Scouring and boiling-out of cotton; action of alkalies and sulphated oils. Bleaching of wool; stoving with sulphur dioxide; bleaching with sodium and hydrogen peroxides, potassium permanganate, etc. Bleaching of cotton; use of chloride of lime; study of the proper conditions for bleaching. Methods employed for yarn and cloth bleaching.

In this course the student performs a series of experiments illustrative of the different essential points to be noticed in the scouring and bleaching of the various textile materials. A constant reference is made to the chemistry of the processes, with a chemical study of the materials employed and the by-products obtained. By this means the student soon learns to appreciate the importance of acquiring a knowledge of chemistry, and his efforts are stimulated in this direction by having brought to his attention concrete examples of the industrial applications of the chemistry he is studying simultaneously with this course.

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In addition to a complete set of descriptive experiments, a thorough course of lectures on the subject is given, and the theoretical study of the course is conducted by a set of quiz questions and periodical examinations on the same.

DYEING III.—ACID AND BASIC DYES.

General method of wool dyeing; use of neutral and acid baths. After-chromed acid dyes. Method of dyeing alkali blue. After-treatment of acid dyes with metallic salts. Methods of applying badly leveling dyes. Use of chromotrope, eosin, and sulphur dyes. General method of applying acid dyes to cotton; use of various mordants in cotton dyeing. Application of basic dyes to wool; study of the different methods. Use of basic dyes for topping. Methods of mordanting cotton and the dyeing with basic colors. Study of the different metallic salts used for fixing. After-treatment of basic dyes on cotton. Use of various tannins.

This course serves as an introduction to the real study of dyeing. The method of using the different dyestuffs is thoroughly studied in a course of lectures which work hand in hand with the experimental laboratory work. The student carries out a large number of experiments with different dyes on small test skeins. In this way he becomes familiar not only with the different methods of applying the dyestuffs, but also acquires a fund of knowledge respecting the relative shades and values of a large number of dyes, representing all the principal ones on the market. A very complete collection of sample dyes, of both foreign and domestic manufacture, are at his disposal. Weekly quizzes and monthly examinations are held in this subject, and the student also receives detailed criticism of all his experiments.

Besides the experimental dyeing of small test skeins, each student is required to help in the dyeing of larger quantities of various classes of goods which are operated upon in the well-equipped dye-house of the school. Lots of from 1 to 50 pounds

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are constantly being dyed, including loose stock, yarns, and piece goods, so the student has plenty of opportunity of doing considerable practical dye-house work which will prove of the highest value in his technical studies.

DYEING IV.—SUBSTANTIVE AND MORDANT DYES.

General methods of dyeing wool with substantive colors. After-treatment of substantive dyes on wool with metallic salts. Application of union dyes. Use of substantive dyes. General methods of dyeing cotton with substantive dyes. Use of different assistants and alkalies. Dyeing cotton at low temperatures. After-treatment of cotton colors with metallic salts; increasing the fastness of cotton dyes. Topping of black, logwood, etc. Formation of developed color and use of sulphur dyes. Various methods of mordanting wool; use of different mordants. Comparison of different assistants. Different classes of alizarine dyes on wool. Methods of mordanting cotton and the dyeing of the same with alizarine colors.

This course is a continuation of the preceding, and is taken up along the same general lines. Every experiment given to the student is for the purpose of illustrating and emphasizing a definite point of instruction, and the experiments carried out proceed in a logical order of development. The purpose of each experiment and all its essential points are clearly explained in a course of lectures which run along parallel to the laboratory work. Weekly quizzes are held, as well as monthly reviews and examinations.

DYEING V.—PRINCIPLES OF SHADE COMPOUNDING AND MATCHING.

Primary, secondary, and tertiary colors. Preparation of tints of single dyes. Compounding of two dyes in different percentages. Preparation of colors containing three dyestuffs. Match-

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ing of samples on wool yarn; on cotton yarn. Dyeing of loose wool and cotton to shade. Matching colors from one class of fabrics to another.

In this course the student prepares a large number of standard compound shades by the use of one, two, and three dyestuffs. A number of different sets of dyes are employed, each member of the class selecting one set apiece. The shades are dyed on cotton, wool, and silk in the form of yarn, cloth, and loose stock. In this manner the student becomes familiar with the mixing qualities of dyestuffs, and obtains a good idea of just how to synthesize a compound shade by the use of a few definite dyestuffs. The course also has great practical value, in that each student acquires a large number of standard shades prepared by himself, which in his after-work will prove of inestimable value for the proper matching of shades, as the different members of the class eventually exchange their shades with each other and each student becomes well equipped in this respect. The value of shade matching is early impressed on the student, and, as aptitude and accuracy in this can only be acquired by practice, each student is required to match a large number of shades on different classes of goods and with different classes of dye. And hereinafter throughout the dyeing course he is constantly called upon to match colors to be dyed on large lots of materials.

DYEING VI.—COLOR-MIXING AND SPECTROSCOPY.

Study of the phenomena of light and the nature and cause of color. Nature of color in dyestuffs and pigments. Color absorption in the mixing of dyes. Use of the chromatic circle in the comparison and compounding of different dyes. The spectroscope; its construction and use; its application to the study of color in dyeing and in dyestuffs. The tintometer and its use. Dichroism in dyes; methods of determining the same by the spectroscope and tintometer. Effect of dichroism in compounding

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dyes and in color-matching. Effect of character of surface on colors of dyed goods. Effect of artificial light on colors. Study of primary, secondary, and tertiary colors; tints, shades, and tones of colors. Complimentary colors and color diagrams.

This course serves as a logical continuation of the preceding, and is intended to give the student some insight into the science of color and the principles of color-mixing. The laboratory is equipped with a number of the very best forms of spectroscopes, together with a Lovibund tintometer especially designed for textile work. The spectra of a number of representative dyes are plotted by the student, and the mixing qualities of the dyes are deduced therefrom; and this scientific work is supplemented by practical dye tests in the laboratory, to show how the one is capable of clearly explaining the other. A large number of gelatine films of different dyestuffs are prepared, and their color phenomena and mixing qualities are thereby studied. The practical value of these scientific studies is constantly held before the student, that he may learn to apply to his practical needs in the dye-house the theoretical results of his higher scientific training. These spectroscopic studies give an insight into the true nature and properties of different dyestuffs which cannot be gained by any other means.

DYEING VII.—SULPHUR DYES; DEVELOPED DYES; INDIGO; ANILINE BLACK; TURKEY RED.

Chemistry of the sulphur dyes; general methods of applying the same. Precautions to be taken with sulphur dyes; functions of the different agents in the dyebath. Methods of after-treating and topping the sulphur dyes. The different groups of sulphur colors; cachou de laval; autogene colors; immédial colors; katigene colors; thiogene colors; thion colors; eclipse colors; buffalo thiol colors: kryogene colors: cross-dye colors: pyrol colors; thional colors. The chemistry of the

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developed dyes; study of the dyeing, diazotizing, and developing process. Use and nature of different developers. Methods of after-treating and topping developed colors. The naphthol colors; paranitraniline; dianisidine blue; azophor red, etc. History of indigo-dyeing; methods of cultivation of plant and extraction and preparation of the dyestuff. The chemical principles of indigo dyeing; preparation of the indigo vat. Study of the hydrosulphite vat; the zinc vat; the copperas vat; the woad vat. Methods of dyeing cotton with indigo; of dyeing wool. Preparation of artificial indigo; comparison of natural indigo with the synthetic product. Preparation and use of indigo extract. Testing of indigo on the fibre; distinction from log-wood, alizarine blue, aniline and anthracene colors. Analysis of indigo; comparison of different methods. Valuation of commercial samples of indigo and indigo extract. The chemical principles involved in the dyeing of aniline black. Study of the necessary conditions and precautions in dyeing aniline black; one bath black; oxidized black; methods of ageing and oxidizing. Application of aniline black to hosiery; to yarn and piece goods. Methods of testing aniline black. The chemical principles of Turkey red dyeing. Study of methods of mordanting and fixing; effects of oiling and steaming. Comparison of old process and new process Turkey red. Erban and Specht's method of dyeing Turkey red. Methods employed in identifying and testing Turkey red. Methods of preparing and testing mordants used in dyeing Turkey red.

In this course some of the chief methods of dyeing now in vogue are discussed, and by considerable experimentation on the part of the student he becomes familiar with the principles and methods underlying these processes, together with the numerous precautions necessary to carry out these methods of dyeing successfully. By testing the dyed goods, he also becomes familiar with methods of discriminating between properly dyed and improperly dyed material, a subject which is very important to the manufacturer, commission-house dealer, and the buyer.

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DYEING VIII.—DYEING OF LOOSE STOCK, TOPS; COP, AND WARP DYEING; CLOTH DYEING.

Study of the different machines employed in dyeing loose stock; nature of dyes to be employed. Machines for top dyeing; conditions necessary for success; advantages of process. Cop-dyeing machines for wool and cotton; character of dyes used in cop dyeing; advantages of cop dyeing. Methods of warp dyeing; machines used in and dyes most suitable for warp dyeing. Methods of dyeing woven fabrics; wool, cotton, and union goods.

This course is intended to make the student familiar with the latest appliances and methods of dyeing textile material in its various forms. This branch of dying is undergoing many radical changes with the constant improvement in dyeing machinery, and large quantities of loose stock and tops are now dyed in specially constructed machines, whereby results are obtained which hitherto were impossible. Dyeing in the cop is also coming into vogue, especially in foreign countries, and offers peculiar advantages, but its conditions must be thoroughly understood in order to obtain successful results. The student will also have the opportunity of using the loose stock warp and cloth-dyeing machines with which the dye-house of the school is fully equipped.

DYEING IX.—MINERAL DYES AND THE NATURAL DYEWOOD.

General principles of applying mineral pigments in dyeing. Production of chrome-yellow and chrome-orange. Use of iron-buff and chrome-green; nankeen and khaki shades. Formation of manganese bistre; Prussian-blue; iron-black. The minor mineral pigment dyes. Study of the fastness of mineral dyes; their advantages and disadvantages. The principal natural dye-woods still in use; logwood, fustic, archil, cochineal. Methods of applying these to wool and cotton. The limitation of the

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natural dyewoods. The minor vegetable coloring-matters; cutch, gambier, etc. Methods of testing the natural dyewoods.

The mineral and vegetable dyes are at present but little used in comparison with the extensive application of the coal-tar dyes; but their historical importance is very great, and in certain cases some of them still possess considerable value. To be thorough in his understanding of the complete art of dyeing, the student cannot afford to pass over this branch of the subject. He carries out by practical experimentation the production of the most important effects to be obtained by the proper use of mineral pigments and the various vegetable coloring-matters. Many of the fastest and most highly prized colors are still dyed by those methods, as instanced in the costly Persian and Indian rugs.

DYEING X.—SILK DYEING AND WEIGHTING.

Study of the silk fibre in relation to its dyeing and weighing; cultivation and production of silk. Raw silk, *ecru*, soupled and boiled-off silk; organzine and tram silks; spun silk; silk noils. Methods of boiling-off silk; character of soap and water used. Nature and uses of silk glue and boiled-off liquor. Methods of bleaching silk. Tussah and wild silk; boiling-off and bleaching these silks. Application of different classes of dyes to silk; the acid dyes; basic dyes; substantive dyes; mordant dyes. Methods of brightening, lustring, and serooping silk. Use of different mordants on silk for purposes of weighting. Dyeing of weighted blacks; iron and tannin weighting. Weighting of silk for dyeing colors; tin weighting. Other methods of weighting silk. Effect of weighting on silk fibre; proper conditions to be realized in silk weighting. Dyeing of mixed goods; piece dyeing. Testing and determination of weighting on silk goods.

America stands first among the nations in the amount of silk operated upon yearly, and the dyeing and weighting of silk in this country is assuming large proportions; hence it behooves the educated dyer to become familiar, in a general way at least,

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with the processes, and it is this object which this course of study has in view. The student will be given the opportunity of prosecuting considerable laboratory work in this subject. The testing of weighted silks is given special attention.

DYEING XI.—MERCERIZING AND DYEING OF MERCERIZED COTTON.

Chemistry of the mercerizing process. John Mercer and the history of mercerizing. Essential conditions for successful mercerizing. Study of the chemical conditions; of the physical conditions. Different types of mercerizing machines. Various effects to be obtained in mercerizing: craping and lustring. Mercerizing yarn and piece goods. Effect of mercerizing on the fibre; strength, elasticity, etc. Discussion of patents relative to mercerizing. Testing of mercerized goods. Difficulties encountered in dyeing mercerized cotton. Dyes most suitable to be employed. Preparation of various shades on mercerized yarns and cloth. Dyeing of wool and silk material containing mercerized effects. Finishing and scrooping of mercerized goods.

There is no better example of the influence of chemistry on textile industries than is to be found in the discovery and development of mercerizing, whereby a new and valuable product was laid at the disposal of the manufacturer. The chemical principles of the process are thoroughly explained to the student, who is also required to carry out experiments to illustrate the method, and thus become familiar with the proper working conditions. The relation of mercerizing to dyeing is also taken up, and the differences in the dyeing of mercerized and ordinary cotton are thoroughly studied.

DYEING XII.—TEXTILE PRINTING.

Differences between printing and dyeing. The essential elements in printing. The machine; study of its different parts. The different thickening agents used in printing pastes; study of their different properties and values. Methods of preparing and

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mixing pastes. Comparison of the different styles in printing. The pigment style; nature of pigments used, and the methods of preparing the color paste; methods of after-treating and fixing. The direct printing style; use of substantive dyes and the preparation of their color pastes. Steam style with basic colors; methods of fixing. Mordant style; use of alizarine colors and natural dyewoods. Developed style with diazotized colors; primuline and paranitraniline reds. Resist style; chemicals used for resists. Discharge style; the chemistry of discharging; white and colored discharges. Discharge style, with indigo, aniline-black, and paranitraniline-red. Discharging of substantive colors; of basic colors. Study of mordants used in printing and the methods of preparing the same. The function of different assisting agents. Methods of ageing, oxidizing and steaming.

There is a larger number and greater variety of chemicals and chemical processes used in printing than there is in dyeing, and it is the object of this course to give the student a general insight into the underlying principles of the different methods of printing. The printing laboratory of the school is furnished with an experimental printing machine and a number of engraved rollers adapted to the various styles of printing. The course consists of an extensive series of lectures, followed simultaneously with considerable laboratory work in the preparation of different colored patterns illustrating the different styles and methods in vogue, and the use of the different classes of dyestuffs.

DYEING XIII.—PREPARATION AND DYEING OF CHLORED WOOL; DYEING OF ARTIFICIAL SILK, PAPER, LEATHER, PREPARATION OF PIGMENT LAKES.

Action of chlorine and bleaching powder on wool. Properties of chlorod wool; unshrinkable wool. Action of chlorod wool towards dyestuffs; production of novelty effects. Lustring of wool. Study of methods of making artificial silk; Chardonnet

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silk; Lehner silk; Pauly's silk; Viscose silk; Vandura silk, etc. Methods of dyeing artificial silk and testing the same. Preparation of shades on artificial silks. Methods of dyeing paper in pulp form. Preparation of colored samples from pulp. Dyeing of paper in sheet form. The principles of leather dyeing. Dyeing of black on leather; colors on leather. Machinery used in leather dyeing. The chemistry of lake pigments. Use of coal-tar dyes in the preparation of pigments. Testing of lake pigments.

In this course some of the specialized uses of dyestuffs are taken up, the study being conducted in a series of lectures, supplemented by representative experimental work in the laboratory.

DYEING XIV.—DYEING UNION GOODS; SATIN; GLORIA.

General principles to be followed in dyeing cotton-wool fabrics. Adaptability of different classes of dyestuffs. Cross-dyeing of cotton warp goods. Production of single color and novelty effects. The general methods employed in dyeing cotton-silk material. Production of single or solid colors; multi-colored effects. Preparation of shades on satin. The methods of dyeing gloria or wool-silk fabrics; conditions to be observed.

In this course the student combines his knowledge of the dyeing of the different fibres in order to suit the conditions dealt with. A number of novel effects are worked out by each student, as well as the production of solid colors.

DYEING XV.—DYEING LINEN; JUTE; RAMIE; OMBRE AND NOVELTY DYEING.

Chemical and physical nature of the linen fibre; methods of retting and preparation. Application of different classes of dyes to linen; fast colors on linen. Bleaching of linen. Chemical and physical nature of the jute fibre. Its behavior with dyestuffs and mordants; dyeing of burlap; use of jute for novelty effects. Methods of bleaching jute. Chemical and physical properties of

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ramie. Methods of preparing mixed ramie goods. Study of bizarre methods in dyeing wool, cloth, and silk; production of ombre effects. Novelty dyeing; spray and foam dyeing; splash dyeing.

In this course the special methods of dyeing the minor vegetable fibres are studied, together with the technology of the fibres themselves. Fanciful methods of dyeing wool and cotton are also taken up, in order to understand the processes by which strange and odd effects are obtained.



BOOKS OF THE YEAR.



English and American.

ORGANIC COLORING MATTERS.

By Arthur G. Green, F.I.C.F.C.S.

Second Edition.

Macmillan & Co., London, 1904

THE TEXTILE FIBRES.

J. Merritt Matthews, Ph.D.

John Wiley & Sons, New York, 1904.

INKS, THEIR COMPOSITION AND MANUFACTURE.

C. Harrison Mitchell, B.A., F.I.C., and T. C. Hepworth.

Chas. Griffin & Co., London.

J. B. Lippincott Company, Philadelphia, 1904.

Year-Book for Colorists and Dyers

CHEMICAL TECHNOLOGY AND ANALYSIS OF OILS, FATS AND WAXES.

By J. Lewkowitsch, F.I.C.
Macmillan & Co., 1904.

A METHOD FOR THE IDENTIFICATION OF PURE ORGANIC COMPOUNDS.

Vol. I.

By Samuel Parson Mulliken, Ph.D.
John Wiley & Sons, New York.
Chapman & Hall, Ltd., London.

THE INDUSTRIAL AND ARTISTIC TECHNOLOGY OF PAINT AND VARNISH.

By Alvah Horton Sabin, M.S.
John Wiley & Sons, New York.
Chapman & Hall, Ltd., London.



Foreign.

MANUAL METHODIQUE DE L'ART DU TEINTURIER DEGRAISSEUR.

Par A. F. Gouillon.
Gatièr frères, Paris, 1904.

DE LA LEGISLATION FRANÇAISE SUR LES BREVETS D'INVENTION.

Par M. M. Thiron et J. Bonnet.
Belin & Cie, Paris, 1904.

Educational

TRAITE DES APPRETS ET SPECIALEMENT DES TISSUS DE COTON, BLANCS, TIENTS, ET IMPRIMES.

Par M. Joseph Depierre.

3me Edition.

Paris, 1904.

ENCYCLOPÉDIE UNIVERSELLE DES INDUSTRIES TINC- TORIALES ET ANNEXES TEINTURES—IMPRES- SIONS—BLANCHIMENTS—APPRETS.

Fascicules 33 à 41.

Publiée sous la direction de M. Jules Garçon, 40 bis,
rue Fabert, Paris.

ANILINSCHWARZ UND SEINE ANWENDUNG IN FAERBEREI UND ZEUGDRUCK.

Von Dr. E. Noelting und Dr. A. Lehne.

Zweite Auflage.

Julius Springer, Berlin, 1904.

DIE TEERFARBSTOFFE.

Von Dr. Hans Bucherer.

Goeschen, 1904.

DIE CHROMBEIZEN, IHRE EIGENSCHAFTEN UND VER- WENDUNG.

Von Wilhelm Hallerbach.

A. Hartlebens Verlag, Wien und Leipzig, 1904.

BERICHT UEBER DEN V. INTERNATIONALEN KONGRESS FUER ANGEWANDTE CHEMIE, BERLIN, 1903.

Von Dr. O. N. Witt und Dr. George Pulvermacher.

Berlin, 1904.

Year-Book for Colorists and Dyers

DIE HARZPRODUKTE, GEWINNUNG UND VERARBEITUNG
DER ROHTERPENTINE ZU TERPENTINOEL UND KOLO-
PHONIUM, DESSEN VERARBEITUNG ZU HARZOELLEN,
SCHMIEREN u. s. w., UND HERSTELLUNG DER VER-
SCHIEDENSTEN PRODUKTE, INSBESONDERS DER
HARTHARZE, HARZSAUREN METALLOXYDE u. s. w.

A. Hartlebens Verlag, Wien und Leipzig, 1904.

DIE SYNTHESE DER AZOFARBSTOFFE XXVIII.

Von R. Pauli.

Johann Ambrosius Barth, Leipzig, 1904.



PART VI

List of Dyestuffs
Makers and Methods





List of Dyestuffs, Makers and Methods

ABBREVIATIONS USED TO INDICATE THE DYESTUFF MANUFACTURERS AND THEIR AGENTS.

(A) Berlin Aniline Works, 213-215 Water St., New York; 122 Walnut St., Philadelphia; 124 Pearl St., Boston; 208 Kinzie St., Chicago; 9 E. Pearl St., Cincinnati; 27 S. Tryon St., Charlotte, N. C. American agents for the Actiengesellschaft für Anilinfabrikation in Berlin.

(A A C) American Color & Chemical Co., Albany, N. Y. Agent (At). Consolidated with H. R. W.

(A C) Anchor Color Mfg. Co., 462 Cherry St., New York.

(A M) Actiengesellschaft für Chemische Industrie, Mannheim, Germany.

(Ash) T. C. Ashley & Co., 145 Milk St., Boston.

(At) F. E. Atteaux & Co., 176 Purchase St., Boston; 176 Fulton St., New York; 17 Kinzie St., Chicago; West Fulton St., Gloversville, N. Y.; 53 Colborne St., Toronto, Ontario; 15 Le-moine St., Montreal, P. Q.

(B) Badische Anilin und Sodafabrik, Ludwigshafen am Rhein, Germany. Agent (P K).

(B A Co.) British Alizarine Co., Ltd., Silvertown, Victoria Dock, London, England. Agent (Beh).

(Bai) Bairstow & Co., 211 Pearl St., New York.

(B C F) Basler Chemische Fabrik, Basel, Switzerland.

(Beh) Beach & Co., Hartford, Conn. Agents for (B A Co.). (Br S), (E F W), (Grie) and (Rh).

(Bd) J. A. & W. Bird & Co., 43 Cedar St., New York. Agents for (ClCo) and (LD).

(B E) C. vom Bauer, Elberfeld, Germany.

(B K) Leipziger Anilinfabrik Beyer und Kegel, Leipzig, Germany. (Closed).

Year-Book for Colorists and Dyers

(B L) Bosson & Lane, 36 Central Wharf, Boston, Mass.

(Br S) Brooke, Simpson & Spiller, Ltd., Hackney Wick, London, England. Agents (Beh).

(Bs) C. Bischoff & Co., 88 Park Place, New York; 151 S. Front St., Philadelphia; 124-126 Purchase St., Boston; 10 Weybosset St., Providence; 196 Michigan St., Chicago; 416 St. Paul St., Montreal. Agents for (D) and (L).

(Bt) F. Bredt & Co., 194 Fulton St., New York; 12 S. Front St., Philadelphia. Agents for (K B).

(By) Farbenfabriken, vormals Fried, Bayer und Co., Elberfeld, Germany; 40 Stone St., New York; 32 India St., Boston; 13 N. Water St., Philadelphia; 189 Kinzie St., Chicago.

(C) Leopold Cassella & Co., Frankfort-am-Main, Germany. Manufacture Lyonnaise de Matieres Colorantes, Lyons, France, and Russische Anilinfarbenfabrik, Riga. Agent (Math).

(C D C) Central Dyestuff and Chemical Co., Plum Point Lane, Newark, New Jersey.

(C J) Carl Jäger Anilinfarbenfabrik, Barmen, Germany.

(Cl Co) The Clayton Aniline Co., Ltd., Clayton, Manchester, England. Agent (Bd).

(C R) Claus & Rée, Droylsden, Manchester, England.

(C V) Colne Vale Chemical Co., Milnsbridge, Huddersfield, England.

(Cz) John Casthelaz, Bruère & Co., Belbeuf, Rouen, France.

(D) Farbenfabrik Dahl & Co., Barmen, Elberfeld, Germany. Agents (Bs).

(D H) Farbwerke vormals Durand, Huguenin & Co., Basel and Hünigen. Agent (Klp).

(D W) L. Destree, A. Wiescher & Co., Haeren near Brussels, Belgium.

(E F W) Elton Fold Works, Bury, Lancashire, England. Agent (Beh).

(E H) E. de Haen, List, near Hanover, Germany.

(F) Farbwerk Friedrichsfeld, Mannheim, Germany.

(F G B) F. G. Brown, 112 N. Delaware Ave., Philadelphia.

Dyestuffs, Makers, and Methods

(Fi) Alfred Fischesser & Co., Muhlhausen, Elsass, Germany.
(Closed).

(F T M) Fabriques de Produits Chimiques de Thann et de Mulhouse, Alsace, Germany.

(G) Anilinfarben und Extract Fabriken, vormals Joh, Rud. Geigy & Co., Basel, Switzerland; Greuzbach, Moscow and Maromme. Agent (Kell).

(Gau) Gauhe & Co., Eitdorf, Germany.

(Gb) Anilinfarbenwerk, vormals A. Gerber & Co., Basle, Switzerland. Absorbed by (I).

(Gei) Geisenheimer & Co., 189 Front St., New York; 19 Pearl St., Boston; 31 S. Front St., Philadelphia. Agents for (O).

(Gr) Rob. Graesser Chemical Works, Ruabon, North Wales.

(Grie) Farbwerke Griesheim, Germany. Agent (Beh).

(Gt) Gilbert Aniline Co., Philadelphia.

(H) Read Holliday & Sons, Ltd., Huddersfield, England; 7 Platt St., New York; 125 Pearl St., Boston; 107 North Second St., Philadelphia.

(H M) Heller-Merz Co., Newark, N. J.; 22 Cliff St., New York.

(H R W) Hudson River Anilin Color Works, Albany, N. Y.
Agent (By).

(H S) The Hanna-Schoelkopf Co., Schoelkopf, Hartford & Hanna Co., successors.

(I) Gesellschaft für Chemische Industrie, Basle, Switzerland.
Agent (Klp).

(In) Innis & Co., 120 William St., New York; 36 Strawberry St., Philadelphia; 161 Kinzie St., Chicago.

(Jb) J. B. Ibels, Brussels, Belgium.

(J H) J. Hauff, Stuttgart, Germany.

(Jy) O. S. Janney & Co., 17 N. Water St., Philadelphia; 70 Kilby St., Boston.

(K) Kalle & Co., Biebrich-am-Rhein, Germany; 530 Canal St., New York; 145 Pearl St., Boston; 115-117 South Front St., Philadelphia.

(Kar) Ph. H. Karcher & Co., 14 Cedar St., New York.

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- (K B) Kächler & Buß, Crefeld, Germany. Agent (Bt).
- (Kell) Geigy Aniline and Extract Company, successors to John J. Keller & Co., 69 Barclay St., New York; 135 Pearl St., Boston; 46 North Front St., Philadelphia; 18 Prior St., Atlanta, Ga.; 56 S. Water St., Providence. Agents for (G).
- (Ki) Kinzelberger & Co., Prague, Austria.
- (Kop) A. Klipstein & Co., 122 Pearl St., New York; 50-52 N. Front St., Philadelphia; 283-85 Congress St., Boston; 136 Kinzie St., Chicago; 13 Mathewson St., Providence. Agents for (D H). (I) and (N).
- (L) Farbwerk Mühlheim, vormal's A. Leonhardt & Co., Mühlheim-am-Main, Germany. Agent (Bs).
- (L D) Lepetit, Dollfus e Gansser, Susa, Milan, Italy. Agent (Bd).
- (Lev) Levinstein, Limited, Manchester, England. Agents (Ly).
- (L F) L. B. Fortner, 36-38 Strawberry St., Philadelphia.
- (L L) John W. Leitch & Co., Milnsbridge, England.
- (L M) Leeds Mig. Co., Brooklyn, N. Y.
- (Lo) Charles Lowe & Co., Stockport, England.
- (L P) Lucien Picard & Co., St. Fons, Lyons, France. Operated by (A).
- (L Sch) Lembach & Schleicher, Biebrich-am-Rhein, Germany.
- (Ly) Thomas Leyland & Co., 53 India St., Boston, Mass.; 121 N. Front St., Philadelphia, Pa. Agents for (Lev).
- (M) Chemische Frabriken, vorm. Weiler-ter Meer. Uerdinden, Germany.
- (M) Farbwerke, vormal's Meister, Lucius & Brüning, Höchst-am-Main, Germany, Creil and Moscow. Agent (Mz).
- (Math) Cassella Color Co., successors to W. J. Matheson & Co., Ltd., 182-184 Front St., New York; 126-128 S. Front St., Philadelphia; 524 Atlantic Ave., Boston; 64 Exchange Place, Providence; 47 N. Pryor St., Atlanta, Ga.; Youville Square, Montreal.
- (Mo) Société Chimique des Usines du Rhone, formerly Gillard P. Monnet & Cartier, St. Fons, Lyons, France.

Dyestuffs, Makers, and Methods

(Mz) H. A. Metz & Co., successors to Victor Koechl & Co., 122 Hudson St., New York; 140-142 Oliver St., Boston; 104 Chestnut St., Philadelphia; 19 South Main St., Providence; 4 N. Clark St., Chicago; 210 S. Tryon St., Charlotte, N. C.; Empire Bldg., Atlanta, Ga.; Dock and Brown Sts., Newark, N. J.; 131 Second St., San Francisco, Cal.; 55 Francois Xavier St., Montreal, Can.; 28-30 Wellington St. West, Toronto, Can.; Hamburg, Germany. Agents for (M).

(N) Carl Neuhaus, Elberfeld, Germany. Agent (Klp).

(Nat) National Dye Co., Philadelphia.

(N I) Farbwerk W. Noetzel, Istel & Co., Griesheim-am-Main, Germany.

(N Y B) New York & Boston Dyewood Co., 156 William St., New York; 115 High St., Boston; 122 Arch St., Philadelphia; 16 Hughson St., Hamilton, Ontario.

American Dyewood Company, successors, 156 William St., New York; 648 Bourse, Philadelphia.

(O) K. Oehler, Anilin u. Anilinfarbenfabrik, Offenbach-am-Main, Germany. Agent (Gei).

(P) Société Anonyme des Matières Colorantes et Produits Chimiques de St. Denis, France. A. Poirrier and G. Dalsace, Paris. Agent (S S).

(P C) Theodore Peters, Chemnitz, Germany.

(P K) Kuttroff, Pickhardt & Co., successors to Wm. Pickhardt & Kuttroff, 128 Duane St., New York; 153 Milk St., Boston; 80 S. Water St., Providence; 207 Chestnut St., Philadelphia; 207 Michigan St., Chicago; 215 Sacramento St., San Francisco. Agents for (B).

(P L) Piek, Lange & Co., Amersfoort, Holland. Closed. Chemische Fabreik Amersfoort successors.

(P S) Ferd. Petersen & Co., Schweizerhalle, Basle, Switzerland.

(R) Joh. Conr. Reihlen, Friedensau, Neuhofen, Germany.

(Rice) C. F. Rice, 174 Summer St., Boston.

(R D) Roberts, Dale & Co., Manchester and Warrington, England.

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(R E) Remy, Erhart & Co., Weissensturm-am-Rhein, Germany.
Agent, Fr. Schroeder, 100 William St., New York.

(R F) Ruch et Fils, Pantin, France.

(Rh) Société Chimique des Usines de Rhone, France. Agent
(Beh). See (Mo).

(S) Chemische Fabrik, vormals Sandoz & Co., Basle, Switzerland.

(S B) A. Sevoz & Boasson, Lyons-Vaise, France.

(Sch) Schoellkopf, Hartford & Hanna Co., successors to the
Schoellkopf Aniline & Chemical Co., Buffalo, N. Y.; 100 William
St., New York; 135 N. Water St., Philadelphia; 21 Pearl St.,
Boston; 114 East Pearl St., Cincinnati; 145 Kinzie St., Chicago;
105 Reed St., Milwaukee.

(SS) Sykes & Street, 85 Water St., New York; 215 Chestnut
St., Philadelphia; 396 Atlantic Ave., Boston, Mass. Agents for

(P) Walter F. Sykes & Co., successors Sykes & Hall, 132 Chest-
nut St., Philadelphia.

(St) The Stamford Mfg. Co., 133-137 Front St., New York.

(Th) E. M. Thayer & Co., 106-112 Broad St., Boston, Mass.

(U I) United Indigo & Chemical Co., 176 Federal St., Boston.

(V) Verein Chemischer Fabriken in Mannheim, Germany.
Agent, Roessler & Hasslacher Chemical Co., 100 William St., New
York.

(Va) H. S. Vila, 115 S. Second St., Philadelphia, Pa.

(W) Williams Bros., Hounslow, Middlesex, England.

(W C B) W. C. Barnes & Co., Ltd., Hackney Wick, London,
England. Agent (Math).

(Z) Friedrich Zimmer, Mannheim, Germany.

DYEING METHODS.

For economy of space, in order that the information may be
more readily found, the dyeing methods are given by certain sug-
gestive letters in accordance with the following:

WA indicates wool is dyed in acetic acid.

Dyestuffs, Makers, and Methods

WN means that wool is dyed in a neutral bath.

WG indicates that wool is dyed in a bath containing Glauber's salt.

WGS means that wool is dyed with Glauber's salt and sulphuric acid in the bath.

WGSch indicates that wool is first dyed with Glauber's salt and sulphuric acid in the bath and the color then developed with chrome.

WACH means that wool is first dyed with acetic acid and chrome added to develop the color.

WCh indicates that chromed wool is used with the dye.

SA means that silk is dyed in a bath acidified with acetic acid.

SS means that silk is dyed in a bath acidified with sulphuric acid.

CT indicates that the dyestuff is used on cotton mordanted with tannin.

CD means that cotton is dyed direct in one bath.

CDv indicates that the color is developed on cotton by subsequent treatment after direct dyeing.

CAl indicates cotton dyed with alum and Glauber's salt.

CWD—cotton and wool mixed goods dyed in one bath.

SULPHUR denotes one of the new class of sulphur dyes requiring special treatment.

These extremely brief directions are used for the further reason that the dye manufacturers themselves prefer that specific information be obtained from their offices. In many places no dyeing suggestions are given on this account.



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LIST OF DYESTUFFS, MAKERS AND METHODS.

Name of Dye.	Agent or Maker.	Dye Method.
Acetine Blue	PK	Printing
Acetinduline R	Mz	Printing
Acetopurpurine 8B	A	CD
Acetylene Blue 6B, 3B, Bx, 3R	Klp	CD
Acetylene Pure Blue	Klp	CD
Acid Alizarine Black 3B, 3Bex	Mz	WGSch
Acid Alizarine Black R, AC	Mz	WGSch
Acid Alizarine Black SE, SET paste ..	Mz	Wach
Acid Alizarine Black SE, SET powder..	Mz	Wach
Acid Alizarine Black SN, SNT	Mz	WGSch
Acid Alizarine Black T	Mz	WGSch
Acid Alizarine Blue BB	Mz	WGSch
Acid Alizarine Blue GR	Mz	WGSch
Acid Alizarine Blue Black B	Mz	WGSch
Acid Alizarine Brown B, BB, T	Mz	WGSch
Acid Alizarine Dark Blue SN	Mz	WGSch
Acid Alizarine Garnet R	Mz	WGSch
Acid Alizarine Gray G	Mz	WGSch
Acid Alizarine Green B	Mz	WGSch
Acid Alizarine Green G	Mz	WGSch
Acid Alizarine Grenade R	Mz	WGSch
Acid Alizarine Red B, G	Mz	WGSch
Acid Alizarine Violet N	Mz	WGSch
Acid Alizarine Yellow O, RC	Mz	WGSch
Acid Anthracene Brown T, G, R	By	WGSch
Acid Anthracene Red, G	By	WGSch
Acid Black	Mz	WGS
Acid Black B	AAC	WGS
Acid Black B No. 4	AC	WGS
Acid Black 5B, 8B, FL	By	WGS
Acid Black 10B	Sch	WGS

Dyestuffs, Makers, and Methods

Name of Dye.	Agent or Maker.	Dye Method.
Acid Black C	Klp	WGS
Acid Black 77	AC	WGS
Acid Black 2531	Kell	SS
Acid Black 5534	H	WGS
Acid Black 5535	H	WGS
Acid Black J	NYB	WGS
Acid Black S, 3G	H	WGS
Acid Blue AA	Kell	WGS
Acid Blue BB	Sch	WGS
Acid Blue GG	Sch	WGS
Acid Blue FS, 466	Mz	WGS
Acid Blue 76	Sch	WGS
Acid Blue 100	Sch	WGS
Acid Blue R	NYB	WGS
Acid Blue Black 3B	By	WGS
Acid Brown	Bs	WGS
Acid Brown D	Math	WGS
Acid Brown G	A	WGS
Acid Brown R	A	WGS
Acid Brown Y	Sch	WGS
Acid Carmoisine B	Bk	WGS
Acid Carmoisine 6B	H	WGS
Acid Cerise	Mz, S S	WGS, SS
Acid Cerise O, ii	Mz	WGS, SS
Acid Chrome Black BG, WS	By	WGSch
Acid Chrome Brown T	By	WGSch
Acid Crimson	Bs	WGS
Acid Cyanine BR	By	WGS
Acid Eosine G	Mz	WGS
Acid Fuchsine	Mz, Bs, Klp	WGS
Acid Fuchsine S B	PK	WGS
Acid Green	By, Klp, O	WGS, SS
Acid Green B	P	WGS

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Name of Dye.	Agent or Maker.	Dye Method.
Acid Green 2B	P	WGS
Acid Green 3B, 6B	By, P	WGS
Acid Green 4B	P	WGS
Acid Green bluish	NI	WGS, SS
Acid Green conc.	Mz	WGS
Acid Green conc. D	Mz	WGS
Acid Green conc. G	Mz	WGS
Acid Green conc. M	Mz	WGS
Acid Green conc. ii.	Mz	WGS
Acid Green D	Mz	WGS, SS
Acid Green EC	Mz	WGS, SS
Acid Green extra conc. B	Math	WGS, SS
Acid Green extra conc. paste	Math	
Acid Green GG	H	WGS
Acid Green 5G	Math	WGS
Acid Green J	P	WGS
Acid Green JEEE	P	WGS
Acid Green M	Mz	WGS, SS
Acid Green M., 5 fold conc.	Mz	WGS
Acid Green O	Mz	WGS
Acid Green OG	O	WGS, CT
Acid Green 780	Math	WGS
Acid Grenadine	Kell	WGS
Acid Grenadine B	Kell	WGS
Acid Indigo Blue	Mz, H	WGS
Acid Magenta	Mz ... PK, SS, WGS, SS	
Acid Magenta B	Mz	WGS, SS
Acid Magenta BC Crystals	Kell	WGS, SS
Acid Magenta Crystals	Mz	WGS, SS
Acid Magenta GC Crystals	Kell	WGS, SS
Acid Magenta O	Mz	WGS, SS
Acid Marine Blue A	Math	WGS
Acid Maroon O	Mz	WGS, SS

Dyestuffs, Makers, and Methods

Name of Dye.	Agent or Maker.	Dye Method.
Acid Methyl Violet S7B	PK	WGS
Acid Milling Scarlet	Br S	WGS
Acid Naphthol Orange		WGS
Acid Navy Blue	Bd	WGS
Acid Orange G	Kell	WGS, SS
Acid Phosphine JO	C	Leather
Acid Phosphine GO	Mz	Leather
Acid Phosphine BRO	Mz	Leather
Acid Ponceau	Klp	WGS
Acid Rhodamine R, 3R	Klp	WGS
Acid Rosamine A pat	Mz	WGS, SS
Acid Rubin (see Fuchsine Ex. S)		WGS, SS
Acid Rubin SB	PK	WGS
Acid Rubine BBR	Mz	WGS
Acid Ruby	Klp	WGS
Acid Sky Blue	At	WGS
Acid Violet 2B	Kell, PK	WGS
Acid Violet 3B extra BW	By	WGS
Acid Violet bluish	Kell	WGS
Acid Violet BN, 2BN	PK	WGS
Acid Violet 4B extra	By, A	WGS
Acid Violet 4BN	Klp, PK	WGS
Acid Violet 4BS	Math	WGS, SS
Acid Violet 4BX	By	WGS
Acid Violet 5B extra	Kell	WGS
Acid Violet 5BF	Mz	WGS
Acid Violet 5BFI	Mz	WGS
Acid Violet 5BS	At	WGS
Acid Violet 5BX	Math	WGS
Acid Violet 6B	A, By, Kell, G.	WGS
Acid Violet 6BC	Sch	WGS
Acid Violet 6BF	Mz	WGS
Acid Violet 6BIN	Mz	WGS

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Name of Dye.	Agent or Maker.	Dye Method.
Acid Violet 6BN	Klp, PK	WGS, SS
Acid Violet 6BS	Mz	WGS
Acid Violet 7B	Mz, Klp, PK, WGS, SS	
Acid Violet 7BN	Mz	WGS
Acid Violet Double	Kell	WGS
Acid Violet N	Mz	WGS
Acid Violet R	O	WGS
Acid Violet R conc.	Mz	WGS
Acid Violet R extra	By	WGS
Acid Violet R R	Kell	WGS
Acid Violet 2R extra	By	WGS
Acid Violet 3R extra	By	WGS
Acid Violet 3RA	Mz	WGS
Acid Violet 3RS	Mz	WGS
Acid Violet 4R	Klp, PK	WGS
Acid Violet 4RN	PK	WGS
Acid Violet 4RS	Mz	WGS
Acid Violet 6R	Sch.	WGS
Acid Violet S7B	PK	WGS
Acid Violet S4R	PK	WGS
Acid Violet VSW	O	WGS
Acid Violet ii	Mz	WGS
Acid Violet 11S	HS	WGS
Acid Yellow	Mz, A, Klp, Math, O, SS.	WGS
Acid Yellow Crystals	Mz, Math	WGS
Acid Yellow AT	Math	WGS
Acid Yellow D	A	WGS
Acid Yellow G		
Acid Yellow RS	Bs	WGS
Acid Yellow S. see Naphthol Yellow ...	S.	
Acid Yellow 8822	H	WGS
Acme Brown	Math	CT
Acme Yellow	Mz	WGS, SS

Dyestuffs, Makers, and Methods

Name of Dye.	Agent or Maker.	Dye Method.
Acridine Gold Yellow, G	Bs	CT
Acridine Orange	Mz	SA, CT
Acridine Orange G	Bs	CT
Acridine Orange NO	Mz	CT
Acridine Orange R extra	Mz	CT
Acridine Red B, 2B, 3B	Mz	CT
Acridine Scarlet R, 2R, 3R	Mz	CT
Acridine Yellow	Mz, Bs	SA, CT
Alcohol Blue	S, Bs, By, Mz, PK, SS	
Alcohol Blue SFC	K.	
Alcohol Eosine	tM.	
Alizadine Brown R, W, Y	H	WGSCh
Alizadine Chocolate	H	WGSCh
Alizarine Astrol B	By	WGS, WCh
Alizarine Black Bayer FB, NG, GA ...	By	WGSCh
Alizarine Black 4B	Math	WA
Alizarine Black 4BN	Math	WA
Alizarine Black 4BR	Math	WA
Alizarine Black 4BS	Lev	WA
Alizarine Black 6B	Math	WA
Alizarine Black CB, CT	Mz	WGSCh
Alizarine Black D	Math	WA
Alizarine Black DAC	Mz	CDv
Alizarine Black DCB	Mz	CDv
Alizarine Black DCR	Mz	CDv
Alizarine Black DE	Mz	CDv
Alizarine Black DG	Mz	CDv
Alizarine Black DHW	Mz	CDv
Alizarine Black DN	Mz	CD
Alizarine Black DPG	Mz	CDv
Alizarine Black DPR	Mz	CDv
Alizarine Black DR	Mz	CDv
Alizarine Black DRN	Mz	CD

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Name of Dye.	Agent or Maker.	Dye Method.
Alizarine Black DT	Mz	CDv
Alizarine Black DYG	Mz	CDv
Alizarine Black G	Me, By	WCh
Alizarine Black P	Mz	WCh
Alizarine Black R	Bs, Math	WCh
Alizarine Black RT	Mz	CDv
Alizarine Black S	Mz, Math, PK	WCh
Alizarine Black SRA	PK	WCh
Alizarine Black SW, WB	PK	WCh
Alizarine Black T	Math	WCh
Alizarine Black TBA	A	WGSCh
Alizarine Black, WB extra, SW	B	WCh
Alizarine Black WX extra	PK	WACH
Alizarine Blue A	Mz	WCh
Alizarine Blue A B	B A Co	WCh
Alizarine Blue Black 3B, B	By	WCh
Alizarine Blue Black WB extra	B	WACH
Alizarine Blue ASR	B	WCh
Alizarine Blue B R 3 G	By	WCh
Alizarine Blue C G	By	WCh
Alizarine Blue CRW	SS	WCh
Alizarine Blue CS	Math	WCh
Alizarine Blue DB	Mz	CD
Alizarine Blue DBX	Mz	CD
Alizarine Blue DE	Mz	CD
Alizarine Blue DET	Mz	CD
Alizarine Blue DG	Mz	CD
Alizarine Blue D N	Mz	WCh
Alizarine Blue D N W	Mz	WCh
Alizarine Blue D N X	Mz	WCh
Alizarine Blue DR, D2R, D4R	Mz	CD
Alizarine Blue FA	Mz	WCh
Alizarine Blue G	Mz	WCh

Dyestuffs, Makers, and Methods

Name of Dye.	Agent or Maker.	Dye Method.
Alizarine Blue G B, P L	AC	WCh
Alizarine Blue G N	Bs	WCh
Alizarine Blue G S	At	WCh
Alizarine Blue G T	Bs	WCh
Alizarine Blue GW, JR	By	WCh
Alizarine Blue J G	HS	WCh
Alizarine Blue NGG powder	PK	WCh
Alizarine Blue N S	By	WCh
Alizarine Blue O D R	At	WCh
Alizarine Blue paste	Mz	WCh
Alizarine Blue R	Mz	WCh
Alizarine Blue RR	Mz	WCh
Alizarine Blue S A P, SKY	By	WGS, WCh
Alizarine Blue S paste	PK	WCh
Alizarine Blue S powder	PK	WCh
Alizarine Blue SB powder, paste	Mz	Printing
Alizarine Blue SBW powder	Mz	WCh
Alizarine Blue SCA	Ae	WCh
Alizarine Blue SR powder, paste	Mz	Printing
Alizarine Blue S2R powder, paste	Mz	Printing
Alizarine Blue soluble powder ABS ...	B A Co	WCh
Alizarine Blue Black B, 3B	By	WCh
Alizarine Bordeaux B in paste	By	WCh
Alizarine Bordeaux B D in paste	By	WCh
Alizarine Bordeaux P	Mz	WCh
Alizarine Bordeaux C	Me	WCh
Alizarine Bordeaux G, GG	By	WCh
Alizarine Brown	Mz, By, PK	WCh
Alizarine Brown AS	Klp	WCh
Alizarine Brown DB	Mz	CD
Alizarine Brown DBD	Mz	CD
Alizarine Brown DD	Mz	CD

Year-Book for Colorists and Dyers

Name of Dye.	Agent or Maker.	Dye Method.
Alizarine Brown, DG, D2G, D3GO, D3GI	Mz	CD
Alizarine Brown DM	Mz	CD
Alizarine Brown DR	Mz	CD
Alizarine Brown DX	Mz	CD
Alizarine Brown G	Mz	WCh
Alizarine Brown GN, AW, AT	By	WCh
Alizarine Brown O DR	At	WCh
Alizarine Brown paste	Mz	WCh
Alizarine Brown powder	Mz, By	WCh
Alizarine Brown O, F, N	Mz	WCh
Alizarine Brown R	Mz, Me. Rice	WCh
Alizarine Brown R B	By	WCh
Alizarine Brown S O	PK	WCh
Alizarine Brown Y	By	WCh
Alizarine Cardinal	By	
Alizarine Carmine	B A Co	WCh
Alizarine Carmine Blue B, G	By	WCh
Alizarine C A	B A Co	WCh
Alizarine Claret DB, DG	Mz	CD
Alizarine Claret R paste	Mz	WCh
Alizarine Coelestol R	By	WGS, WCh
Alizarine Cyanine G paste	By	WCh
Alizarine Cyanine Green 3G	By	WGSCh
Aliz. Cyanine R, 2R, 3R, RA extra	By	WCh
Alizarine Dark Blue	PK	WCh
Alizarine Dark Blue, D, DR	Mz	CD
Alizarine Dark Blue D3R	Mz	CD
Alizarine Dark Blue S	Mz	WCh
Alizarine D G, GI	PK	WCh
Alizarine Fast Black SP	By	WCh
Alizarine Gray SP	By	Printing
Alizarine Green paste	Pk	WCh

Dyestuffs, Makers, and Methods

Name of Dye.	Agent or Maker.	Dye Method.
Alizarine Green B	Bs	WCh
Alizarine Green B	A	WA
Alizarine Green C, SS	By, Rice	WCh
Alizarine Green CE paste, CG, CK	By	WGS, WCh
Alizarine Green DW	PK	WCh
Alizarine Green EB, G	Bs	WCh
Alizarine Green F	A	WACH
Alizarine Green F powder	Sch	WCh
Alizarine Green KO	By	Sulphur
Alizarine Green S paste	Mz	WCh
Alizarine Green SE	Mz, PK	WCh
Alizarine Green S pat	Math	WCh
Alizarine Grenat R	Mz	WCh
Alizarine Indigo DO	Mz	CD
Alizarine Indigo S paste	PK	WCh
Alizarine Irisol R	By	WGS, WCh
Alizarine Lanacyl Blue BB, 3B	Math	WCh
Alizarine Lanacyl Navy Blue B pat ...	Math	WA
Alizarine Lanacyl Blue R	Math	WA
Alizarine Lanacyl Violet B pat	Math	WA
Alizarine Maroon paste	PK	WCh
Alizarine Olive OD	At	WCh
Alizarine Orange A paste	PK	WCh
Alizarine Orange AO, AOP	B A Co	WCh
Alizarine Orange DF, DG, DR	Mz	CD
Alizarine Orange G	Mz, By	WCh
Alizarine Orange N, O	Mz	WCh
Alizarine Orange powder	Mz	WCh
Alizarine Orange P	Mz	WCh
Alizarine P	B A Co	WCh
Alizarine Red D4B	Mz	CD
Alizarine Red E D	Bs	WCh
Alizarine Red F paste	Mz	WCh

Year-Book for Colorists and Dyers

Name of Dye.	Agent or Maker.	Dye Method.
Alizarine Red GG	PK	WCh
Alizarine Red PS	By	WCh
Alizarine Red RG	Mz	WCh
Alizarine Red RX	Mz	WCh
Alizarine Red S	Mz, PK	WCh
Alizarine Red SDG	Mz	WCh
Alizarine Red WB	By, PK	WCh
Alizarine Red WS	Mz	WCh
Alizarine Red X	Mz	WCh
Alizarine Red D1B new	Mz	WCh
Alizarine Red No. 1 powder	Mz	WCh
Alizarine Red 2A	Mz	WCh
Alizarine Red 2ABL. BL	Mz	WCh
Alizarine Red 2 BW	Mz	WCh
Alizarine Red 1 W	Mz	WCh
Alizarine Red 1 WS	Mz	WCh
Alizarine Red 2 A W	Mz	WCh
Alizarine Red 2W	Mz	WCh
Alizarine Red 2 WS	Mz	WCh
Alizarine Red 3 GW	Mz	WCh
Alizarine Red 3W	Mz	WCh
Alizarine Red 3 WS	Mz	WCh
Alizarine Red 4 FW	Mz	WCh
Alizarine Red 4 WS	Mz	WCh
Alizarine Red 5 WS	Mz	WCh
Alizarine Saphirol SE	By	WGS
Alizarine Saphirol B	By	WGS
Alizarine Scarlet DG, D2R	Mz	CD
Alizarine Sky Blue B	By	WGS
Alizarine Violet extra	At	WCh
Alizarine Violet G paste	Mz	WCh
Alizarine Violet N	St	WCh
Alizarine Violet B	Bs	WCh

Dyestuffs, Makers, and Methods

Name of Dye.	Agent or Maker.	Dye Method.
Alizarine Violet paste	Mz	WCh
Alizarine Viridine paste FF	By	WCh
Alizarine Yellow A paste	PK	WCh
Alizarine Yellow C	Bs	WCh
Alizarine Yellow DG, DR, D3G, DOO ..	Mz	CD
Alizarine Yellow DR	Bs	WCh
Alizarine Yellow FS	Klp	WCh
Alizarine Yellow GG, GGW, N	Mz	WCh
Alizarine Yellow GG	A	WACH
Alizarine Yellow GG	Lev	WGS
Alizarine Yellow LW	PK	WCh
Alizarine Yellow O, paste, R, RW pow- der	Mz	WCh
Alkali Blue	A, Brs, Bs, By, Sch, Kell, Klp, Math, O, PK, SS.	
Alkali Blue B, 2B, 3B, 4B, 5B, 6B, 7B, BBR, R, R conc. extra	Mz.	
Alkali Blue B, 2B, 3B, 4B, 5B, 6B, 6B90 per cent., 6B, 100 per cent., R, 2R, 3R	Math.	
Alkali Blue 2B, 3B, 4B, 5B, 6B, H6B, H5BOO, H3BOO	O.	
Alkali Blue D	A.	
Alkali Blue 4B	Jb.	
Alkali Blue XG	Br. S.	
Alkali Brown	Bs	CD
Alkali Brown R	LP	CD
Alkali Fast Green B G	By	WGS
Alkali Fast Red B, G	Mz	WGS
Alkali Green	Br. S.	
Alkali Red	Bs.	
Alkali Red B, R	Mz.	

Year-Book for Colorists and Dyers

Name of Dye.	Agent or Maker.	Dye Method.
Alkali Violet, CA	PK.	
Alkali Violet R	By.	
Alkali Yellow, R	Bs.	
Alpine Blue		WGS
Alsace Brown B, BB, MR, LL, R	At	CD
Alsace Gray	Fi.	
Alsace Green, J	FTM.	
Amaranth	Mz, Math	SS
Amaranth B	Math	WGS, SS
Amaranth E, O	Mz	WGS, SS
Amaranth extra	SS.	
Amido Acid Black B, 4B, 6B	A	WGS
Amidoazol Cutch	H	CD
Amidoazol Drab	H	CD
Amidoazol Gray	H	CD
Amidoazol Green B	H	CD
Amido Fast Black	Mz	Printing
Amido Fast Brown	Mz	Printing
Amido Naphthol Black 4Bex, 6B, S, R.	Mz	WGS
Amido Naphthol Red 2B, 6B, G	Mz	WGS
Aminogene Blue R		
Aminogene Violet R		
Anil Blue R	K.	
Aniline Brown	Fi.	
Aniline Green	Math	WGS, CT
Aniline Orange	Math	CT
Aniline Yellow	Bt	WGS, SS, CT
Aniline Yellow extra	Klp.	
Aniline Yellow NT	Math	CD
Anisoline	Math	CD
Anisol Red	Mo	WGS, SS, CD
Anthra Alizarine Bordeaux	At	WACH
Anthra Alizarine Carmoisine	At	WACH

Dyestuffs, Makers, and Methods

Name of Dye.	Agent or Maker.	Dye Method.
Anthra Alizarine Green CG	At	WACH
Anthra Alizarine Red B	At	WACH
Anthra Alizarine Yellow G	At	WACH
Anthracene Acid Black C	Klp	WCh
Anthracene Acid Black LW, SF, ST, SW	Math	WGSCh
Anthracene Acid Brown B, G, N, R, SW pat, V	Math....	WGS, WCh, SA
Anthracene Black		
Anthracene Blue C	Math	WCh
Anthracene Blue S, SWX, WB, WG, WR, SWGG extra	PK	WCh
Anthracene Brown paste	Ba, Co, By	WCh
Anthracene Brown G paste, R paste ..	By	WCh
Anthracene Brown O paste	Mz	WCh
Anthracene Brown RR	Bs	CDv
Anthracene Chrome Black, F, 5B, FE ..	Math	WGSCh
Anthracene Chrome Blue BB, F, G	Math	WGSCh
Anthracene Chrome Brown, D	Math	WCh
Anthracene Chrome Green	Math	WCh
Anthracene Chrome Red, A	Math	WCh
Anthracene Chrome Violet, B R	Math	WCh
Anthracene Croceine B, G	F	WCh
Anthracene Dark Blue	PK	WCh
Anthracene Green, or Coeruleine		WCh
Anthracene Red	By, I, Klp	WGS
Anthracene Red B	HS	WGS
Anthracene Scarlet OR	HS	WGS
Anthracene Yellow paste	By	WCh
Anthracene Yellow BN, C, GG, R	Math	WGS, WCh
Anthracene Yellow GN	Bs	WCh
Anthracite Black BR	Math	WGS
Anthracyanine BL, DL, FL, 3FL	By	WGS, WCh

Year-Book for Colorists and Dyers

Name of Dye.	Agent or Maker.	Dye Method.
Anthracyl Chrome Brown D	D	WACH
Anthracyl Chrome Gray	D	WACH
Anthracyl Chrome Green	D	WACH
Anthracyl Chrome Olive	D	WACH
Anthragallol, or Anthracene Brown ...	Math	WCh
Anthramine yellow	At	WCh
Anthraquinone Blue SR	PK	WGSCh
Anthraquinone Green G	B	WGS, WGSCh
Anthraquinone Violet	PK	WGS
Apollo Red	Kell	WGS
Arabian Black	Bai	CD
Archil Red 3 VN	P	WGS
Archil Substitute N powder	Math	WGS
Archil Substitute G powder	Mz	WGS
Archil Extract, 1, 2, 3, 4	Math	WGS
Archil Extract extra and conc.	Mz	WGS
Arnica Yellow	Kell	CD
Atlanta Yellow 103	HS	CD
Atlas Orange	BrS	WGS, SS
Atlas Red	BrS	WGS, SS
Atlas Scarlet	By	WGS
Auracine G	By	CT
Auramine G	G, Klp, PK	WG, CT
Auramine O, 1 II, conc.	G, Klp, Mz, PK, WG, CT	
Aurantia	A	SS
Aureoline	Klp	CD
Aureosine		
Aurine	Gr, Lo, LP, Mo, RD.	
Auronal Black	Tm	Sulphur
Aurophenine	Mz	CD
Aurophosphine G	A	SA
Aurotine	ClCo.	
Autogene Black	SS	Sulphur

Dyestuffs, Makers, and Methods

Name of Dye.	Agent or Maker.	Dye Method.
Autogene Brown BG	SS	Sulphur
Autogene Gray	SS	Sulphur
Azaleine		
Azarin R, S	Mz	Lakes
Azin Blue, alcohol soluble	Bs.	
Azindon Blue G, R	Mz	CT
Azin Green GO, BO, TO	Mz	WGS, CT
Azin Scarlet G conc. GO	Mz	WG, SA, CT
Azo Acid Black B, BL, G, GL, 3BL, R, TL, extra conc., TL, No. 2 extra	Mz	WGS
Azo Acid Blue B, 3 B conc., 3 BO	Mz	WGS
Azo Acid Brown	By	WGS
Azo Acid Carmine B	Mz	WGS
Azo Acid Fuchsine B, G	Mz	WGS
Azo Acid Magenta B, G, B conc., G conc.	Mz	WGS
Azo Acid Red B	Mz	WGS
Azo Acid Ruby, 2B	Bs	WGS
Azo Acid Violet AL	By	WGS
Azo Acid Violet 4R R extra	By	WGS
Azo Acid Yellow	A, NYB	WGS
Azo Alizarine Black	DH	WCh
Azo Alizarine Bordeaux	DH	WCh
Azo Alizarine Yellow CG	DH	Printing
Azo Archil R	A	WGS
Azo Benzol Fast Crimson	B	WGS
Azo Black O	Mz	WGS, SS
Azo Black Blue	O	CD
Azo Blue	Mz, By, A	CD
Azo Bordeaux	Sch, By, O	WGS
Azo Brown N	Bs, Math	WGS
Azo Brown O	Mz	WGS
Azo Brown V	Mz	WGS
Azo Brown Y	P	WGS

Year-Book for Colorists and Dyers

Name of Dye.	Agent or Maker.	Dye Method.
Azo Carmine G paste, B	PK	WGS
Azo Carmine G	A	WGS
Azo Cardinal G	A	WGS
Azo Chromine	Kell	WGS
Azo Coccine 7B, or Cloth Red	A	WGS
Azo Coccine G, or Tropaeoline 0000 ...		WGS
Azo Coccine 2R	A	WGS
Azo Cochineal	By	WGS
Azo Coralline	Bs	WGS
Azo Corinth	O.	
Azo Crimson L, S	By	WGS
Azo Dark Blue	O	CD
Azo Diphenyl Blue		
Azo Eosine	By	WGS
Azo Flavine	Bs, PK	WGS, SS
Azophone Black	At	CD
Azophone Green B, G	At	CD
Azo Fuchsine B, G, GN, S	By	WGS
Azo Galleine	Kell	WCh
Azo Green	By	WCh
Azo Grenadine S	By	WGS
Azo Mauve B, R	O	CD
Azo Merino Black B, 6B	C	WGS
Azo Merino Blue 3B, G	Math	WGS
Azo Merino Dark Blue R	Math	WGS
Azo Navy Blue B, 3B	Math	WGS
Azomine Black	UI	CD
Azomine Yellow	UI	CD
Azo Orange R	Klp	CD
Azo Orseille BB	Math	WGS
Azo Orseille R	A.	
Azo Orseilline	A. By, O, PK.	

Dyestuffs, Makers, and Methods

Name of Dye.	Agent or Maker.	Dye Method.
Azo Patent Black 3BK, 4BK, 3BKN,		
TK	K	WGS
Azophenine Blue R	Grie	CT
Azophloxine 2G	By	WGS
Azophor Black S, DP	Mz	Printing
Azophor Blue D	Mz	Printing
Azophor Orange MN	Mz	Printing
Azophor Orange	Mz	Printing
Azophor Pink A, Base	Mz	Printing
Azophor Red PN	Mz	Printing
Azo Pink BB	Mz	Printing
Azo Red B, BB, G	Bs	WGS
Azo Rubine	O, Sch	WGS
Azo Rubine	O	WGS
Azo Rubine A	Math	WGS
Azo Rubine SG	A	WGS
Azo Ruby	tM, Lev	WGS
Azo Ruby S, 2S	A	WGS
Azo Saffranine	Kell	WGS
Azo Turkey Red	O.	
Azo Violet	Mz, A, By, Lev	CD
Azo Wool Blue B, SE	Math	WGS
Azo Wool Violet 4B, 7R	Math	WGS
Azo Yellow	Bt, K, Mz, Klp, O, SS	WGS, SS
Azo Yellow conc.	Mz	WGS
Azo Yellow M	Klp	WGS, SS
Azo Yellow N, NR	Kell	SS
Azo Yellow OR	Mz	WGS, SS
Basel Blue, BB, R paste, S	Klp	WG, CT
Bavarian Blue alcohol soluble	A.	
Bavarian Blue DBF, DSF	A	SA, CT
Belgium Blue	AC.	

Year-Book for Colorists and Dyers

Name of Dye.	Agent or Maker.	Dye Method.
Bengal Blue	K.	
Bengal Deep Black D, 2B	SS	CDv
Bengal Pink	Klp	WGS
Benzaline Blue B	K	CT
Benzal Green, O powder, OO crystals...	O	WN, CT
Benzindamine	NI.	
Benzo Azurine G, 3G	Mz, A, By	CD
Benzo Azurine R, 3R	Mz, By	CD
Benzo Black	Mz, By	CD
Benzo Black Blue G, 5G, R	Mz, By	CD
Benzo Black Brown	By	CD
Benzo Blue BB, 3B, BX	By	CD
Benzo Bordeaux 6B	By	CD
Benzo Brown G, 5R, RC, NB, GG, MC	By	CD
Benzo Chrome Black B	By	CD
Benzo Chrome Black Blue, B	By	CD
Benzo Chrome Brown B, BS, 5G, R, 3R.	By	CD
Benzo Copper Blue B	By	CD
Benzo Cyanine B, 3B, R	By	CD
Benzo Dark Brown	By	
Benzo Dark Green B, BB, GG	By	CD
Benzo Fast Black 3B, G	By	CD
Benzo Fast Blue B, Bn G, 5R	By	CD
Benzo Fast Gray	By	CD
Benzo Fast Orange S	By	CD
Benzo Fast Pink 2BL	By	CD
Benzo Fast Red L, GL	By	CD
Benzo Fast Scarlet 4BS, 8BS, 5BS	By	CD
Benzo Fast Violet R	By	CD
Benzo Fast Yellow 5GL	By	CD
Benzo Flavine O. No. 2	O	CT
Benzo Gray	By	CD
Benzo Green G, C	By	CD

Dyestuffs, Makers, and Methods

Name of Dye.	Agent or Maker.	Dye Method.
Benzo Indigo Blue	By	CD
Benzoin Yellow	B	WCh
Benzo Nitrol Brown G, N, 2R	By	CD
Benzo Nitrol Bordeaux G	By	CDv
Benzo Olive extra	By	CD
Benzo Orange R	A, By	CD
Benzopurpurine B, 4B, 6B, 10B	Mz, By, A	CD
Benzopurpurine 4Bex conc.	Mz	CD
Benzopurpurine 4B double	Mz	CD
Benzo Red SG, 10B	By	CD
Benzo Rhodamine 3B	By	CD
Benzo Rhoduline Red B, 3B	By	CD
Benzo Sky Blue	Mz, By, A	CD
Benzo Violet RL extra	By	CD
Benzyl Black B, 4B	Klp	WGS
Benzyl Blue S	Klp	WGS
Benzyl Bordeaux	Klp	WGS
Benzyl Blue S	Klp	WGS
Benzyl Green G, B	Klp	WGS
Benzyl Violet 4B, 10B, 5B, 5BN	Klp	WGS
Benzyl Violet	Bt, CR, RE, tM, WGS, SS, CT	
Berlin Blue A	A	WGS
Best Magenta Crystals	Bt.	
Best Violet, or Brilliant India Dye	Bt.	
Biebrich Acid Black ST	K	WGS
Biebrich Acid Blue, G, GG	K	WGS
Biebrich Acid Red B, 4B, 3G	K	WGS
Biebrich Acid Violet 2B, 6B	K	WGS
Biebrich Alizarine Black 4BN	K	WGS
Biebrich Patent Black AN, 4AN, AO 4BN, RO, 4B, B	K	WGS
Biebrich Patent Jet Black, 3BO	K	WGS

Year-Book for Colorists and Dyers

Name of Dye.	Agent or Maker.	Dye Method.
Biebrich Scarlet	K	WGS
Bismarek Brown	A, CR, F, K, Math, NI, Lh, O, PK, SW ...	CT
Bismarek Brown B	Klp	CT
Bismarek Brown EE	Math	CT
Bismarek Brown FFG	Math	CT
Bismarek Brown G	Klp	CT
Bismarek Brown GG	Math, O	CT
Bismarek Brown GOO, GOOO	O	CT
Bismarek Brown R, Y Rex	Mz	CT
Bismarek Brown ROO, ROOO	O	CT
Bismarek Brown T	Klp	CT
Bismarek Brown YS 8049	Math	CT
Bitter Almond Oil Green	Bt	WGS, SS, CT
Black Black O	Mz	WGS, SS
Black Blue O	Mz	WGS, SS
Black Soluble in Oil	Mz, Math.	
Blackley Blue	Lev	SS, CT
Blue Asozin	P	WGS
Blue Alcohol Soluble	Mz.	
Blue B, BB	Mz	Printing
Blue BJB	P	WGS
Blue Black B	PK	WGS
Blue Black GR, 5G	Klp	WGS
Blue Black Diphenyl	Kell	CD
Blue BS	Math, P	WGS
Blue 3BS	P	WGS
Blue BW	O.	
Blue CB, alcohol and water soluble ...	Klp.	
Blue extra	RD	CT
Blue for Silk	Math.	
Blue for printing, paste and powder ...	Mz.	
Blue for white	Kell	SS

Dyestuffs, Makers, and Methods

Name of Dye.	Agent or Maker.	Dye Method.
Blue G	Jy	CT
Blue, green shade	Mz	WGS, SS, CT
Blue Green S	PK.	
Blue R	Mz	Printing
Blue, red shade	Mz	WGS, SS, CT
Blue T conc.	Mz	WGS, SS
Blue 2111	At	CD
Blue Black 5534	H	WGS
Body Blue O	Mz	WGS, SS, CT
Bordeaux B	Mz, A, Math, LP ...	RF
Bordeaux BL	Math	WGS, SS
Bordeaux BX	By	WGS
Bordeaux COV	A	CD
Bordeaux DH	Klp	WGS
Bordeaux Diamine B, S	Math	CD
Bordeaux extra	By	WGS
Bordeaux G	Bs, By	WGS
Bordeaux R extra	Mz	WGS
Bordeaux S	A, RF	WGS
Bottle Green	Beh.	
Brahma Orange	Z.	
Brahma Red B, BB, 6B	Z.	
Braxeline	At.	
Bright Blue extra	Mz	CD
Bright Blue O	BL	CD
Bright Yellow T	Mz, PK	CD
Brilliant Acid Carmine 6B	O	WGS
Brilliant Acid Green 6B	By	WGS
Brilliant Alizarine RR, 5R	By	CD
Brilliant Alizarine Blue D, G, R	By	WCh
Brilliant Alizarine Blue EM	Mz	WCh
Brilliant Alizarine Bordeaux R	By	WCh
Brilliant Alizarine Cyanine G, 3G	By	WCh

Year-Book for Colorists and Dyers

Name of Dye.	Agent or Maker.	Dye Method.
Brilliant Alizarine Viridine F.....	By	WCh
Brilliant Anthrazol	B	WGS
Brilliant Azurine B	A, By	CD
Brilliant Azurine 5G	Mz, A, By	CD
Brilliant Benzo Green B	By	CD
Brilliant Black B	PK	WGS
Brilliant Black Solution BE, NE, RE ..	Math.	
Brilliant Blue	Bs.	
Brilliant Blue 7B	O.	
Brilliant Blue HB	Gt	WGS
Brilliant Bordeaux S	A	WGS
Brilliant Carmine	NYB	SS
Brilliant Carmine Green	Lev	WGS
Brilliant Carmoisine O	A	WGS
Brilliant Cochineal 2R, 4R	Math	WG
Brilliant Chrome Red, paste	By.	
Brilliant Cloth Blue Bex, G	K	WAS
Brilliant Congo G, R	Mz, A, By	CD
Brilliant Cotton Blue B57	Sch	CAI
Brilliant Cotton Blue, greenish	By	CT
Brilliant Cresyl Blue 2B	L	CT
Brilliant Crimson B, O, N	Mz	WGS, CT
Brilliant Crocein blue, and yellow	Mz	WGS, SS, CAI
Brilliant Croceine AZ	Math	WGS
Brilliant Crocein B, BB	Mz	WGS, SS
Brilliant Croceine 3B	Mz, By, Math.	WGS, SS
Brilliant Croceine BOO	Math	WGS
Brilliant Croceine 5B	Mz, Math	WGS, SS
Brilliant Croceine 6B, 7B, 9B, 10B	Math	WGS
Brilliant Croceine D	Mz	WGS
Brilliant Croceine M, MOO	Math	WGS
Brilliant Croceine MOO	NYB	SS
Brilliant Croceine R	Mz, Math	WGS

Dyestuffs, Makers, and Methods

Name of Dye.	Agent or Maker.	Dye Method.
Brilliant Croceine ROO	Math	WGS
Brilliant Croceine Scarlet D	Mz	WGS
Brilliant Cyanine Blue R	By	WCh
Brilliant Dianil Red R, R Conc.	Mz	CD
Brilliant Diazine Blue B, B	K.	
Brilliant Direct Navy Blue B	Bs	CD
Brilliant Direct Red 249	Sch	CD
Brilliant Fast Red P	By	Paper
Brilliant Geranine B, 3B	By	CD
Brilliant Green	Mz, By, CJ, CR, F, K, Klp, Math, PK, NI, O, PS, RE, tM, Bt, WN, SS, CT	
Brilliant Green crystals, B, C	Mz	WN, CT
Brilliant Green crystals extra, extra N, powder superior, ia, No. 12	Mz	WN, SA, CT
Brilliant Green O crystals	O	WN, CT
Brilliant Indigo Carmine sub	Lev	WGS
Brilliant Lake Scarlet G, R, 2 R.....	Mz	WGS, SS
Brilliant Milling Green B	C	WGS
Brilliant Milling Scarlet 2 B	Lev	WGS
Brilliant Opaline	Gb.	
Brilliant Orange G	Mz, A	WGS, SS
Brilliant Orange O, R.....	Mz	WGS, SS
Brilliant Orcelleine, pat	Math	WGS
Brilliant Orseille C	Math	WGS
Brilliant Ponceau G, GG	Math	WGS
Brilliant Ponceau 4R	By	WGS
Brilliant Ponceau 5R	Bs, By, Math	WGS
Brilliant Purpurine 10B	A	CD
Brilliant Purpurine R	Mz, A, By	CD
Brilliant Purpurine 4R	RF	CD
Brilliant Purpurine 5B	RF	CD

Year-Book for Colorists and Dyers

Name of Dye.	Agent or Maker.	Dye Method.
Brilliant Red	Sch	WGS
Brilliant Red D	Klp	WGS
Brilliant Red Congo G	Mz. A. By	CT
Brilliant Rhoduline Violet R	By	CT
Brilliant Rubine O	Mz	WGS. SS
Brilliant Safranine G	A	WGS. CT
Brilliant Scarlet	Lev.	
Brilliant Scarlet G, GG, R, RR, 3R, 4R, 6R, T	Math	WGS
Brilliant Scarletine	H	WGS
Brilliant Scarlet N3R	SS	WGS
Brilliant Sky Blue G	Bs	CD
Brilliant Sulfon Azurine R	By	
Brilliant Sulphon Red B	By	WGA
Brilliant Wool Blue B extra, G extra ..	By	SS, WGS
Brilliant Yellow	Mz, A, By, SB, SCH, tM	WGS, SS
Brilliant Yellow I	H	WGS
Brilliant Yellow S	PK	WGS, SS
Bromofluoresceic Acid Crystals	Mz	Lakes
Bromofluoresceic Acid AG, A3G, A6G ..	Mz	Lakes
Bromofluoresceic Acid AL	Mz	Lakes
Bromofluoresceic Acid BA. conc.	Mz	Lakes
Bromofluoresceic Acid BL Blue	Mz	Lakes
Bromofluoresceic Acid BL Yellow	Mz	Lakes
Bronze Blue J	PK	
Bronze Diamine G	Math	CD
Brown BBX	BrS	CD
Brown JE, JEEE	P	WGS
Brown M	P	WGS
Brown N	P	WGS
Brown SDM, SDP	SS	CD
Brown for Leather O	Mz	Tannin

Dyestuff's, Makers, and Methods

Name of Dye.	Agent or Maker.	Dye Method.
Buffalo Black 4B, 8B	Sch	WGS
Buffalo Brown R	Sch	CT
Buffalo Bordeaux	Sch	CD
Buffalo Chrome Black	Sch	WGSCh
Buffalo Crimson B	Sch	CD
Buffalo Rubine	Sch	CD
Buffalo Scarlet 4B	Sch	CD
Buffalo Thiol Black GB	Sch	Sulphur
Buffalo Violet 4R	Sch	CD
Butter Yellow	HM	
Cachou de Laval S	P	Sulphur
Cachou Diamine	Math	CD
Calico Yellow, GG, 3G, 4G	Kell	Printing
Campanuline	A	CD
Canarine	Klp.	
Capri Blue GN	Mz, Bs	CT
Capri Green B, G, GG	Mz	CT
Carbazol Yellow W	PK	CD
Carbid Black, BO, R, RO	Klp	CD
Carbon Black B, BD	Mz	WGS
Carbon Black BW	K	CD
Cardinal	Mz	WG, SA, CT
Cardinal B, extra	SW	CD
Carmoisine	A, By, PK, SS	WGS
Carmoisine cone.	A, K, SS	WGS
Carnotine	ClCo	CD
Caroubier	Klp.	
Cashmere Black B, 6B, T	By	WGS
Cerasine	Klp.	
Cerasine Blue LC	Math.	
Cerasine Orange G	Math.	
Cerasine Red, A	Math.	
Cerasine Yellow, G T	Math.	

Year-Book for Colorists and Dyers

Name of Dye.	Agent or Maker.	Dye Method.
Cerise	Mz, Bt, Klp, Math, NI, PK, PS, SS, WG, SA, CT	
Cerotine Orange C, extra	O	WGS
Chestnut Brown	A	CD
Chicago Blue B, 4B, 6B, R, 2R, 4R, RW. A	A	CD
Chicago Gray	Kell	CD
Chicago Orange, G, extra, 3G	Kell	CD
China Blue	Mz, A, BrS, By, PN, WGS, SS, CT	
China Blue R, No. 1, 2	Math.	
China Blue 71115	KB.	
China Green crystals	Kell.	
Chinoline Blue	PK.	
Chinoline Green	A.	
Chinoline Red	A.	
Chinoline Yellow	Mz, BrS, By, PK, WGS	
Chloramine Blue 6B	S	CD
Chloramine Brown C, G	By	CD
Chloramine Orange G	By	CD
Chloramine Red SBS	By	CD
Chloramine Violet	By	CD
Chloramine Yellow GG	By	CD
Chloranisidine	B	Lakes
Chlorantine Blue 2B	Klp	CD
Chlorantine Lilac	Klp, PK	CD
Chlorantine Red 8B	Klp	CD
Chlorantine Violet B, R	Klp	CD
Chlorazol Blue 6G, R, 2R, 6B	H	CD
Chlorazol Brown A, B, C, R	H	CD
Chlorazol Green B, Y	H	CD
Chlorazol Heliotrope	H	CD
Chlorazol Yellow G, 3G, Y	H	CD

Dyestuffs, Makers, and Methods

Name of Dye.	Agent or Maker.	Dye Method.
Chlorine Blue R	Klp	CT
Chlorophenine G, O, R, Y	ClCo	CD
Chlorophenine Orange, AA, R	ClCo	CD
Chromanil Black RF, BF, 2BF, 3BF ...	A	CD
Chromanil Brown GG, R, 2G	A	CD
Chromate Black 6B, TB4B	A	WGSC
Chromazine Violet	Sch	WCh
Chromazo Maroon	Sch	WCh
Chromazo Red RB	Sch	WCh
Chromazo Yellow GR	Sch	WCh
Chromazon Blue B, R	Kell	WGS
Chromazon Red	Kell	WGS
Chrome Azurine S	S	WCh
Chrome Black	Jy, SW	WGS
Chrome Black, B, T	Mz	WGSC
Chrome Blue	Jy, By, Math	WCh
Chrome Blue B	Mz	WCh
Chrome Blue 2B, 4B, BN, PE, R, 2R, 3R, No. 470	Kell	WCh
Chrome Bordeaux	By	WCh
Chrome Brown G	Kell	WCh
Chrome Brown BO, RO	Mz	WCh
Chrome Fast Black B	A	WCh
Chrome Fast Black F	Klp	WGSC
Chrome Fast Red B, GR	A	WGSC
Chrome Fast Yellow G, 2G, R	A	WCh
Chrome Green	By	WCh
Chrome Leather Black B C	Math.	
Chrome Orange	By	WCh
Chrome Patent Black TB, TG, TR, T ..	K	WGSC
Chrome Patent Green A, N	K	WGSC
Chrome Prune	By	WCh
Chrome Red R	HS	WCh

Year-Book for Colorists and Dyers

Name of Dye.	Agent or Maker.	Dye Method.
Chrome Red paste	By	WCh
Chrome Ruby paste	By	WCh
Chrome Violet powder	By, Kell	WCh
Chrome Violet paste	By	WCh
Chrome Yellow	H S, N I	WCh
Chrome Yellow D	By	WCh
Chrome Yellow G	By, HS	WCh
Chrome Yellow P	Kell	WCh
Chrome Yellow R	SS	WACH
Chromine G	K	WCh
Chromine Blue B. T	HS	WCh
Chromium Patent Black DG, DGG	K	WGSCh
Chromocyanine	DH	Printing
Chromoglancine V M paste	Mz	Printing
Chromogen I	Mz	WGSCh
Chromotrop 2B, 6B, 8B, 10B, 2R	Mz	WGS
Chromotrop DW, FB, S, SB, SN, SR, F4B	Mz	WGSCh
Chromotrop Blue A	Mz	WGSCh
Chrysamine	By	CD
Chrysamine G	Mz, A, By	CD
Chrysamine GG	By	CD
Chrysamine R	Mz, A, By	CD
Chrysaniline		
Chrysoidine	Mz, A, By, K, PK, Lh, WN, SA, CT	
Chrysoidine AG, FF	Math	WN, SA, CT
Chrysoidine G	Kell, Klp.	WN, SA, CT
Chrysoidine R	Mz Kell, Klp, Math, WN, SA, CT	
Chrysoidine Y, YY	Mz, Sch, Math, WN, SA, CT	
Chrysoidine Brown	Math	WN, SA, CT

Dyestuffs, Makers, and Methods

Name of Dye.	Agent or Maker.	Dye Method.
Chrysoine	Klp, Mz, PK, SS, tM	
Chrysoline	Kell	WGS
Chrysophenine R	Mz, A, By	CD
Chrysophenine conc., ext. conc.	Mz	CD
Chrysophenine G	Mz	CD
Cinereine	SS.	
Cinnabar Scarlet	BK.	
Cinnamine S	W.	
Cinnamon Brown	PS	WGS; CT
Citronine	Mz, BrS, Fi, Klp, O, SS	WGS, SS
Citronine A	Mz	WGS, SS
Citronine AA, 2A, extra, AHE NE	SS	SA
Citronine G, GOO, GOOO	O.	
Citronine NE	SS	SA
Citronine Diphenyl G	Kell	CD
Citronine Diphenyl GOO	O	SS
Claret Red	Sch	WGS
Claret Red B, 3B, G, GR, R, B extra O, S	Mz	WGS
Clayton Aurotine	ClCo.	
Clayton Carnotine	ClCo	WGS
Clayton Cloth Red	ClCo	WGS
Clayton Fast Gray D	ClCo	Sulphur
Clayton Fast Black	ClCo	Sulphur
Clayton Red	ClCo.	
Clayton Yellow, G	ClCo	CD
Clematine	Kell	CT
Cloth Blue O	Mz	WGS, SS, CT
Cloth Blue S	L	WGS
Cloth Brown reddish, yellowish	Mz, By	WCh
Cloth Orange	Mz, By	WCh
Cloth Red	Mz	WCh

Year-Book for Colorists and Dyers

Name of Dye.	Agent or Maker.	Dye Method.
Cloth Red, see Stanley Red	ClCo.	
Cloth Red B	Mz, Bs, By, O	WCh
Cloth Red BA	A	WCh
Cloth Red 3B extra	By	WCh
Cloth Red BO, FRBO	O	WCh
Cloth Red G	Mz, By, O	WCh
Cloth Red G extra, 3G extra	By	WCh
Cloth Red GA, 3GA	A	WCh
Cloth Red GO, 3GO	O	WCh
Cloth Red O	Mz	WCh
Cloth Red OB	O	WCh
Cloth Red R	Bs	WCh
Cloth Scarlet G, R	K	WGS
Coccein 3B	SS	WGS
Coccine 2B	A	WGS
Coccinin, B	Mz	WGS
Cochineal Red A	PK	WGS
Cochineal Scarlet G	Sch	WGS
Cochineal Scarlet PS	By	WGS
Cochineal Scarlet 2R, 4R	Sch	WGS
Cochineal Substitute	Klp	WGS
Coelestine Blue B	By	CT
Coeruleine A, B, S BWR	Mz	WCh
Coeruleine S powder or paste	Mz, By, Klp, PK	WCh
Coeruleine SW, powder or paste	Mz, By	WCh
Cold Black, BR	A	CD
Columbia Black B, BB, FB, R, FF	A	CD
Columbia Black FF extra, FB strong.		
F2B, 2BX, 2BW, EAextra, WAextra	A	CD
Columbia Black Blue G	A	CD
Columbia Black Green D	A	CD
Columbia Blue G, R	A	CD

Dyestuffs, Makers, and Methods

Name of Dye.	Agent or Maker.	Dye Method.
Columbia Brown R	A	CD
Columbia Chrome Black BB.....	A	CD
Columbia Fast Blue 2G	A	CD
Columbia Fast Scarlet 4B	A	CD
Columbia Green	A	CD
Columbia Orange R	A	CD
Columbia Red 8B, 6B, 4B, 2B	A	CD
Columbia Violet R	A	CD
Columbia Yellow	A	CD
Concentrated Cotton Blue R, 2R, 1, 2, 3, 4, B	Mz	WGS, SS, CAI
Congo	Mz, A, By	WN, CD
Congo B	SS.	
Congo BB	A, By	CD
Congo G R	A, By	CD
Congo Blue BX, R, 2B, 3B, 2BX	A	CD
Congo Brown G, R	A	CD
Congo Corinth B, G	A, By	CD
Congo Fast Blue B, R	A	CD
Congo GR	A, By	CD
Congo Orange G	A	CD
Congo Orange R	Mz, A, By	CD
Congo P, Pure Blue	A	CD
Congo 4 R	Mz, A, By	CD
Congo Red	Mz, Sch, Klp, By, A.	CD
Congo Rubine	Mz, A	CD
Congo Violet	A	CD
Congress Red FEN	NI	CD
Coomassie Black B	Lev	CWD
Coomassie Blue	Lev	CWD
Coomassie Violet	NS	WGS
Coomassie Wool Black BA, conc., R, S.	Lev	WGS
Copper Black S	Mz	WGS, Dev

Year-Book for Colorists and Dyers

Name of Dye.	Agent or Maker.	Dye Method.
Copper Blue B, B extra	Mz	WGS, Dev
Copper Red		WGS, Dev
Coralline	LP.	
Coreine, AB, AR, RR	Klp	WCh
Cotton Black B, 3B	PK	CD
Cotton Blue	Mz, Bs	CAI
Cotton Blue BI	HS	WGS, CAI
Cotton Blue 3B, 6B extra	Mz, O	WGS, SS, CT
Cotton Blue O	Kell.	
Cotton Blue OO extra	O	CT
Cotton Blue R	PK, SS	CT
Cotton Bordeaux	PK	CD
Cotton Brown	PK	CD
Cotton Brown 3G, R	ClCo	CD
Cotton Brown N	Math	CD
Cotton Brown R, G	PK	CD
Cotton Dark Brown B	AC	CD
Cotton Green CG	A	CD
Cotton Navy Blue CR	AC	CD
Cotton Orange G, R	PK	CD
Cotton Ponceau	BK.	
Cotton Red, 4B	PK	CD
Cotton Rhodanine	BCF	CT
Cotton Scarlet	PK	CAI
Cotton Scarlet 3B	Sch, K	CAI
Cotton Scarlet O	Mz	WN, SA, CT
Cotton Scarlet, yellowish	Math	SA, CT
Cotton Yellow G, GB, R	PK	CD
Cresotine Yellow G, R	Mz, A, By, O	CD
Cresyl Blue BB, 6B, BBSO, RR	Bs	CT
Cresyl Fast Violet B, BB	Bs	CT
Cresyl Green GG	Bs	CT
Cresyl Violet BB	Bs	CT

Dyestuffs, Makers, and Methods

Name of Dye.	Agent or Maker.	Dye Method.
Criterion Blue G	At	WGS
Croceine AZ, X	Math.	
Croceine B, 3B	Sch	WGS, SS
Croceine 3BX	By, K	WGS
Croceine Orange	By, K	WGS
Croceine Scarlet 3B	Sch, By, K ...	WGS, CD
Croceine Scarlet 4BX	K	WGS
Croceine Scarlet 7B	By	WGS
Croceine Scarlet 8B	By, K	WGS
Croceine Scarlet 10B	By	WGS
Croceine Scarlet O extra	K	WGS
Cross Dye Black B, 4B, 6B	H	CD
Cross Dye Black RT	H	Sulphur
Cross Dye Drab	H	Sulphur
Cross Dye Yellow	H	Sulphur
Crow Black	Mz, PK	CD
Crumpsall Direct Fast Brown B, M O ..	Lev	CD
Crumpsall Fast Yellow YYFD	Lev	CD
Crumpsall Yellow	Lev	WGS
Crystal Ponceau	A, PK	WGS
Crystal Ponceau 6R	Mz, Math	WGS
Crystal Scarlet 6R	Mz, Math	WGS, SS
Crystal Violet 5B	Math.	
Crystal Violet 5BO	Klp	WN, SS, CT
Crystal Violet O	Mz, PK	WN, SA
Crystal Violet P	By	WN, SA
Cuba Black R	O	CD
Cumidine Ponceau	Mz, A, PK	WGS
Cumidine Red	Mz, A, PK	WGS
Cupranil Brown B, R C	Klp	CD
Curcumeine extra	A	WGS
Curcumine	O	WGS, SS
Curcumine S, S extra	Mz, A, By	CD

Year-Book for Colorists and Dyers

Name of Dye.	Agent or Maker.	Dye Method.
Curcumine Substitute	SS	WGS
Curophenine	ClCo	CD
Cutch Brown D	Mz, N	WG, SA, CT
Cutch Brown D	ClCo	CD, WGS
Cutch Brown G	Mz	WG, SA, CT
Cutch Brown GG	BrS	CD
Cutch Brown O, R, VY	ClCo	CD, WGS
Cyanine B	Mz	WGS, SS
Cyanol extra. BB, FF, C	Math	WGS
Cyanol Fast Green G	Math	WGS
Cyanol Green B, CG, 6G	Math	WGS
Cyanosine	Klp.	
Cyanosine Alcohol Soluble	Mz.	
Cyanthrol BGA, R, RA, RB, RBA, RGA	B	WGS
Cyklammine	Mo	WG, SA
Cyprus Blue R	A	WGS Copper
Cyprus Green B	A	WGS Copper
Dahlia		WGS, SS, CT
Dahlia for white	Kell	SS
Dark Blue	Mz, PK	WGS
Dark Brown	SW	CD
Dark Brown M. MB	Mz	WG, SA, CT
Dark Green	PK	WGS
Dark Green 682	BrS	CD
Deep Wool Black 2B, 3B	A	WG
Delphine Blue B. B conc.	Mz, S	WCh
Delta Purpurine 5B	Mz, By	CD
Delta Purpurine 7B	Mz, A, By	CD
Delta Purpurine G	By	CD
Diamine Azo Black B. BB pat	Math	CD
Diamine Azo Blue 54, 55	Math	CD
Diamine Azo Blue R, RR, pat	Math	CD

Dyestuffs, Makers, and Methods

Name of Dye.	Agent or Maker.	Dye Method.
Diamine Black B, BH, BO, HW, RO, BX, RMW	Math	CD
Diamine Black Blue B	Math	CD
Diamine Black Green N	Math	CD
Diamine Blue B, 2B, 3B, BG, BX, C4B, 6G, C4R, LG, C2R, LR, NC, RW, 3R, SRX, 50, 52, 53, 55, AB, AZ	Math	CD
Diamine Blue Black E, 72592, R, RL ..	Math	CD
Diamine Bordeaux B, S	Math	CD
Diamine Brilliant Blue G	Math	CD
Diamine Brilliant Scarlet S	Math	CD
Diamine Bronze B, C, SF	Math	CD
Diamine Brown B, GG, 3G, M, OO, QQ, V, 31, 32, 33, 34, 35, 36, 37	Math	CD
Diamine Catechine B, G, pat. 3G	Math	CD
Diamine Catechu	Math	CD
Diamine Cutch	Math	CD
Diamine Cyanine B, 3B, R	Math	CD
Diamine Dark Blue B, R	Math	CD
Diamine Dark Green	Math	CD
Diamine Deep Blue RB	Math	CD
Diamine Deep Dark Blue B, R	Math	CD
Diamine Fast Black L	Math	CD
Diamine Fast Blue C, FFB, FFG, G....	Math	CD
Diamine Fast Brown G	Math	CD
Diamine Fast Red, F	Math	CD
Diamine Fast Yellow A, AR, B, FF ...	Math	CD
Diamine Gold	Math	CD
Diamine Gold Yellow	Math	CD
Diamine Gray G	Math	CD
Diamine Green B, G, CL	Math	CD
Diamine Heliotrope G	Math	CD
Diamine Milling Black B, FG extra ...	Math	CD

Year-Book for Colorists and Dyers

Name of Dye.	Agent or Maker.	Dye Method.
Diamine Jet Black CR, OO, 4D, RB, SE, SOOO, JEI	Math	CD
Diamine New Blue G, P, R	Math	CD
Diamine Nitrazol Black, B	Math	CD
Diamine Nitrazol Brown B, BD, T, G, RD	Math	CD
Diamine Orange D, DC, G, GC, R, B ..	Math	CD
Diamine Pure Blue, A, FF	Math	CD
Diamine Red B, 3B, 10B, D, No. 72732 ..	Math	CD
Diamine Rose RD, B extra, BG, GD, GGN	Math	CD
Diamine Scarlet B	Math	CD
Diamine Scarlet 3B	HS, Math	CD
Diamine Sky Blue, FF	Math	CD
Diamine Steel Blue L	Math	CD
Diamine Violet N	Math	CD
Diamine Violet Red	Math	CD
Diamine WO	Math	CD
Diamine Yellow N, paste, R paste, CP ..	Math	CD
Diamineral Black B, 3B, 6B	Math	CD
Diamineral Blue R	Math	CD
Diamineral Brown G	Math	CD
Diaminogene B, BR, CF, extra	Math	CDv
Diaminogene Blue BB, G, RA, 2RA, NA, NB, 3RN	Math	CDv
Diaminogene Sky Blue	Math	CDv
Diamond Black F, NG, GA, FB, PV, PVB, P2B	By	WGSCh
Diamond Blue 4R	UI	WGS
Diamond Brown R, 3R	By	WGSCh
Diamond Fast Acid Black	Me.	
Diamond Fast Blue, Red Yellow	Me.	
Diamond Flavine G	By	WCh

Dyestuffs, Makers, and Methods

Name of Dye.	Agent or Maker.	Dye Method.
Diamond Green SS	Mo, By	WGSCh
Diamond Green B, G	PK.	
Diamond Green crystals	KB.	
Diamond Orange paste	By.	
Diamond Yellow paste G, R	By	WCh
Dianil Black AC	Mz	CDv
Dianil Black CB, CR	Mz	CDv
Dianil Black E	Mz	CDv
Dianil Black G	Mz	CDv
Dianil Black HW	Mz	CD
Dianil Black N	Mz	CD
Dianil Black PG, PR	Mz	CDv
Dianil Black R	Mz	CDv
Dianil Black RN	Mz	CD
Dianil Black T	Mz	CDv
Dianil Blue B, BX, 2BM, 3BM	Mz	CD
Dianil Blue E, ET	Mz	CD
Dianil Blue G	Mz	CD
Dianil Blue R, 2R, 3R, 4R	Mz	CD
Dianil Blue 2RM, 3RM	Mz	CD
Dianil Brilliant Black B, G, 2G, R, 2R ..	Mz	CD
Dianil Brown B, BD	Mz	CD
Dianil Brown D	Mz	CD
Dianil Brown G, 2G, 3GO, 3GI	Mz	CD
Dianil Brown M	Mz	CD
Dianil Brown R	Mz	CD
Dianil Brown X	Mz	CD
Dianil Claret B, G	Mz	CD
Dianil Crimson B, G	Mz	CD
Dianil Dark Blue R, 3R	Mz	CD
Dianil Dark Green B	Mz	CD
Dianil Deep Black. B conc., FF conc., TV conc., BR extra conc.	Mz	CD

Year-Book for Colorists and Dyers

Name of Dye.	Agent or Maker.	Dye Method.
Dianil Direct Yellow S	Mz	CD
Dianil Green G	Mz	CD
Dianil Indigo O	Mz	CD
Dianil Japonine G	Mz	CD
Dianil Orange F, G, O, BM	Mz	CD
Dianil Red 4B	Mz	CD
Dianil Scarlet G, 2R	Mz	CD
Dianil Yellow G, 3G, R, OO, MB	Mz	CD
Dianisidine Blue	By, Mz	Printing
Dianol Black Brown	Lev	CD
Dianol Blue G	Lev	CD
Dianol Brilliant Red extra	Lev	CD
Dianol Brown NB, R, Y, YY	Lev	CD
Dianol Green G	Lev	CD
Dianol Olive	Lev	CD
Dianol Orange Brown, ABZ	Lev	CD
Dianol Violet 2B, R	Lev	CD
Dianthine, B, G	Lev	CD
Dianthine Pink	BrS	CD
Diazethyl Black B, R	By	CD
Diazine Black BRS	Kell	CD
Diazine Blue B, 2B, R	K	CT
Diazine Brown	K, SW	CT
Diazine Green	K	CT
Diazo Black	K	CT
Diazo Black 2B, BHN, 3B, G, R	By	CD
Diazo Blue B	By	CDv
Diazo Blue Black RS	By	CDv
Diazo Bordeaux	By	CDv
Diazo Brilliant Black B, R	By	CDv
Diazo Brilliant Scarlet Bex, 3Bex, 6Bex, Gex	By	CDv
Diazo Brown G	By	CDv

Dyestuffs, Makers, and Methods

Name of Dye.	Agent or Maker.	Dye Method.
Diazo Brown R extra, V	By	CDv
Diazo Deep Blue BB, 3B	By	CDv
Diazo Fast Black	Bal	WGS
Diazo Fast Black BHX, 3B, G	By	CD
Diazo Fast Black SD	By	CDv
Diazo Indigo Blue B, M, BR, extra, 3R, 2RL, 4RL	By	CDv
Diazo Marine Blue B, G	O	CDv
Diazo Navy Blue 3B	By	CDv
Diazo Rubine R	By	CDv
Diazo Violet R	By	CDv
Diazogene B, BB, 3B	By	CDv
Diazurine B, G	Kell	CDv
Diazyl Black	Bs	CD
Diazyl Brown G, T	Bs	CD
Dimethyl Orange	Bs	CD
Dingley Blue B, 2R	Sch	CD
Dingley Yellow 17	Sch	CD
Dioxine	L	WCh
Diphen Blue B Base, R Base	A	CD
Diphenylamine Blue	Mz.	
Diphenylamine Orange	Klp.	
Diphenyl Black B, DBB, ERF, 3G, R, RR	Kell	CD
Diphenyl Blue B, 2B, BM, DBB, EFR, EFS, 3G, NT, RR	Kell	CD
Diphenyl Blue Black	Kell	CD
Diphenyl Brown B, BY, CB, CG, CGG, R, RR, Y, 3G	Kell	CD
Diphenyl Chrysoine RR, 3G	Kell	CD
Diphenyl Catechine G, R, B	Kell	CD
Diphenyl Citronine G	Kell	CD
Diphenyl Dark Blue R	Kell	CD

Year-Book for Colorists and Dyers

Name of Dye.	Agent or Maker.	Dye Method.
Diphenyl Fast Black	Kell	CD
Diphenyl Fast Brown G, GN	Kell	CD
Diphenyl Fast Black	Kell	CD
Diphenyl Fast Yellow G, GG	Kell	CD
Diphenyl Grey	Kell	CD
Diphenyl Green G, GB, 3G, KCG	Kell	CD
Diphenyl Indigo Blue	Kell	CD
Diphenyl Orange GG, RR, ORW	Kell	CD
Diphenyl Phosphine G, conc.	Kell	CD
Diphenyl Red 8B	Kell	CD
Diphenyl Violet R, BC	Kell	CD
Diphenyl Yellow, R, GG, 3G	Kell	CD
Direct Black B	SS	CD
Direct Black BFG	A	CD
Direct Black GBN, K, G	Klp	CD
Direct Black R	SS	CD
Direct Black X	Bs	CD
Direct Black BK	Klp	CD
Direct Black DR, X	Bs	CD
Direct Black No. 8	A C	CD
Direct Black No. 5062	At	CD, CDv
Direct Blue B	Mz, K, Klp	CD
Direct Blue 2B	SS	CD
Direct Blue 3B	Jy	CD
Direct Blue 3BN	K	CD
Direct Blue 3BX	SS	CD
Direct Blue 5B	HS	CD
Direct Blue G, R	Mz	CD
Direct Blue R	Klp	CD
Direct Blue 2R, 3B, 2R	Jy, SS.	
Direct Blue Black 2B	By	CD
Direct Brilliant Blue BM	Mz	CD
Direct Brilliant Orange BO	L	CD

Dyestuffs, Makers, and Methods

Name of Dye.	Agent or Maker.	Dye Method.
Direct Brilliant Orange M	Mhy	CD
Direct Brown BB	Bs	CD
Direct Brown BL	BL	CD
Direct Brown BS, GS, RS	Kell	CD
Direct Brown GG	By	CD
Direct Brown GX	Bs	CD
Direct Brown J	Klp	CD
Direct Brown M	SS	CD
Direct Brown N	L	CD
Direct Brown NX	Bs	CD
Direct Brown RD, 35	BL	CD
Direct Brown R, S	Kell	CD
Direct Brown RS	Kell	CD
Direct Brown SDP	SS	CD
Direct Brown TB	Mz	CD
Direct Brown TS, TSB	Klp	CD
Direct Brown VX	Bs	CD
Direct Brown 130, 131	HS	CD
Direct Brown 5002	SJW	CD
Direct Buffalo Brown R	Sch	CD
Direct Catechu Brown	NI	CD
Direct Cross Dye Black RH, RS, NM, AM	H	Sulphur
Direct Cross Dye Blue B, R	H	Sulphur
Direct Dark Green	Mz	CD
Direct Deep Black E, R, RW, T, E extra, RW extra	By	CD
Direct Deep Red P	At	CD
Direct Fast Brown B, GG	By	CD
Direct Fast Yellow B	L	CD
Direct Garnet A	BL	CD
Direct Golden Yellow	BL	CD
Direct Gray	Jy	CD

Year-Book for Colorists and Dyers

Name of Dye.	Agent or Maker.	Dye Method.
Direct Gray B	Klp, SS	CD
Direct Gray J	SS	CD
Direct Gray N	AC	CD
Direct Gray R	SS, Klp	CD
Direct Gray reddish	Klp	CD
Direct Gray 4R	SS	CD
Direct Green, CP	Klp	CD
Direct Green B, No. 276	AC, SS	CD
Direct Green BX, S	BL	CD
Direct Green C, CB	Mz, Kell	CD
Direct Green CY	Kell	CD
Direct Green G	Jy	CD
Direct Green P, A	Klp	CD
Direct Green Y	Klp	CD
Direct Green YYC	Sch	CD
Direct Green 177, 228	HS	CD
Direct Indigo Blue A, BN	Klp	CD
Direct Indigo Blue RB	At	CD & CDv
Direct Indigo Blue BK	Klp	CD
Direct Lemon Yellow	Klp	CD
Direct Navy Blue C, SB	Sch	CD
Direct New Blue 4B	A	CD
Direct Olive Y	Sch	CD
Direct Orange	Fi.	
Direct Orange G	HS	CD
Direct Orange KR, KY	Kell	CD
Direct Orange OR, R	Kell	CD
Direct Orange R	SS	CD
Direct Orange 2R	K	CD
Direct Orange Y	SS	CD
Direct Orange 12, 69	HS	CD
Direct Oriol Yellow	Kell	CD
Direct Pink	Sch	CD

Dyestuffs, Makers, and Methods

Name of Dye.	Agent or Maker.	Dye Method.
Direct Pink B	Jy	CD
Direct Pink G	S	CD
Direct Plum	Jy	CD
Direct Red	A, By, Fi, Kell	CD
Direct Red B	Bs	CD
Direct Red C, B	AC	CD
Direct Red E, T	Kell	CD
Direct Red 5SE	Kell	CD
Direct Red No. 55	HS	CD
Direct Red extra	Jy	CD
Direct Safranine B	By	CD
Direct Salmon	At	CD
Direct Scarlet B, conc.	K	CD
Direct Scarlet G	K	CD
Direct Scarlet R	K	CD
Direct Sulpho Black RH, RS	H	Sulphur
Direct Tan 5506	HS	CD
Direct Union Black	Jy.	
Direct Violet A, C	Sch	CD
Direct Violet R	Jy	CD
Direct Violet 6 R extra	SS	CD
Direct Yellow	A, Bi, Fi, K, SS	CD
Direct Yellow C	KSS	CD
Direct Yellow C, P	Klp	CD
Direct Yellow BSR, BLR	At	CD
Direct Yellow G	AC, K, SS	CD
Direct Yellow 2G, 3G	K	CD
Direct Yellow NW	BL	CD
Direct Yellow R	AC, By	CD
Direct Yellow R extra	By	CD
Direct Yellow S	Sch	CD
Direct Yellow T	Klp	CD
Direct Yellow 443	FGB	CD

Year-Book for Colorists and Dyers

Name of Dye.	Agent or Maker.	Dye Method.
Direct Yellow 9673	Jy	CD
Discharge Black AF	Mz	WGS, SS
Disulphine Blue G	H	WGS
Domingo Alizarine Black, B	L	WGSCh
Domingo Alizarine Blue G, R	L	WGSCh
Domingo Alizarine Brown B	L	WGSCh
Domingo Black LK	L	WGS
Domingo Blue Black R, B	L	WGS
Domingo Blue P, N, BB	L	WGS
Domingo Chrome Black MFF	L	Special
Domingo Chrome Brown	L	WACH
Domingo Chrome Red G	L	Special
Domingo Chrome Yellow G	L	Special
Domingo Green 3G, H	L	WCh
Domingo Seal Brown	L	WACH
Dominion Yellow O	At	CD
Double Brilliant Scarlet G, 2B, BR	A	WGS
Double Brilliant Scarlet 3 R	By	WGS
Double Green S, F	K	
Double Ponceau 2R, 3R, 4R	By	WGS
Double Scarlet	K	WGS
Double Scarlet extra S	A	WGS
Double Scarlet G	tM	WGS
Double Scarlet R	Lev	WGS
Double Scarlet 2R	tM	WGS
Durophenine Brown V	Cl Co	CD
Eboli Blue	LBs	WG, CD
Eboli Blue B	L	CD
Eboli Green B, G	L, Kl p	CD
Eboli Sky Blue	L	CD
Ebony Black	Klp	CD
Ecarlate B	SS	CD
Ecarlate J, JJ, V	RF	WGS

Dyestuffs, Makers, and Methods

Name of Dye.	Agent or Maker.	Dye Method.
Ecarlate Brilliante	RF	CD
Ecarlate Croceine 3B	Mo.	
Echurine	LM.	
Eclipse Black B, H	Kell	Sulphur
Eclipse Blue B, R	Kell	Sulphur
Eclipse Bronze	Kell	Sulphur
Eclipse Brown 3G, V	Kell	Sulphur
Eclipse Corinth G	Kell	Sulphur
Eclipse Dark Brown	Kell	Sulphur
Eclipse Green GP	Kell	Sulphur
Eclipse Olive	Kell	Sulphur
Eclipse Phosphine GG, R	Kell	Sulphur
Eclipse Yellow G, 3G	Kell	Sulphur
Elgene Base B	A	CD
Elgene Blue	A	CT
Emerald Green Crystals	PK, Bt, By	WG, SA, CT
Emin Red	A	WGS
Empire Black B, G	At	WACH
Empire Orange G	Beh.	
English Yellow		WGS
Eosamine B	A	WGS
Eosine A	PK	WA, SA
Eosine A conc., 2A, AG, A6G	Mz	WA, SA
Eosine bluish	Kell	WA, SA
Eosine B	Klp	WA, SA
Eosine BB	Klp	WA, SA
Eosine 3B	Mz	WA, SA
Eosine 10B, BF	Math	WA, SA
Eosine BN	Math, PK	WA, SA
Eosine DH, DHV	Klp	WA, SA
Eosine extra, extra yellow, extra conc., extra BB, AG, A3G, A5G, D	Mz	WA, SA

Year-Book for Colorists and Dyers

Name of Dye.	Agent or Maker.	Dye Method.
Eosine Bluish, extra yellow, yellowish	Kell	WA, SA
Eosine G	Math	WA, SA
Eosine GGB, GGF, GGG	Math	WA, SA
Eosine J	PK	WA, SA
Eosine 3J, 4J, extra	Mz	WA, SA
Eosine JJF	Math	WA, SA
Eosine S	PK	WA, SA
Eosine Y	Sch	WA, SA
Eosine 2110, 5765	Math	WA, SA
Eosine Scarlet B	Mz, Math	WA, SA
Eosine Scarlet BB extra	Mz, Kell	WA, SA
Eosine Yellowish	A, BrS, K	WA, SA
Erie Blacks	Sch	CD
Erie Green 235, DB	Sch	CD
Erie Blue BX	Sch	CD
Erika B, BN, Bex	A	CD
Erika G, G ex	A	CD
Erika 3GN, 2GN	A	CD
Erio Blue BB, G, R, RR	Kell	WGS
Erio Carmine R	Kell	WGS
Erio Chrome Yellow G, 3G	Kell	WGSch
Eriocyanine	Kell	WGS, SS
Erioglaucine	Kell	WGS, SS
Erio Rubine G, 2R	Kell	WGS
Erio Viridine B	Kell	WGS
Erythrine	PK	SA
Erythrine X	PK	WGS
Erythrosine	Br S, Klp, PK	WA
Erythrosine	Mz, PK	WA
Erythrosine, Bluish, Yellowish	Kell	WA
Erythrosine AG	Mz	WA
Erythrosine B, BB	A	WA
Erythrosine blue shade	Mz	WA

Dyestuffs, Makers, and Methods

Name of Dye.	Agent or Maker.	Dye Method.
Erythrosine BNT, D, DS	Math	WA
Erythrosine extra	Mz	WA
Erythrosine G	PK	WA
Erythrosine yellow shade	Mz, Math	WA
Erythrosine 694	Sch	WA
Ethyl Blue BF	Mz	CT
Ethyl Blue BD, RD	Mz	Printing
Ethylene Blue, B, G, R, RR	B	SA
Ethyl Eosine	A, Bt	WGS, SS
Ethyl Green	PK	WGS
Ethyl Purple 6B	O.	
Excelsior Lake Scarlet JN, 2JCN	Math	WGS
Excelsior Black	Math	WGS
Excelsior Black B, G, 5G	Sch	WGS
Fast Acid Black B, 3B	ADC	WGS
Fast Acid Blue B	By	WGS
Fast Acid Blue R, R conc.	Mz	WGS, SS
Fast Acid Eosine G, G extra	Mz	WGS
Fast Acid Fuchsine B	By	WGS
Fast Acid Green B, BN, BS, BZ	Math	WGS
Fast Acid Magenta G, G conc.	Mz	WGS
Fast Acid Phloxine A, A extra	Mz	WGS
Fast Acid Ponceau	Klp	WGS
Fast Acid Red A	Mz	WGS
Fast Acid Red B	Mz, PK	WGS
Fast Acid Scarlet	Klp	WGS
Fast Acid Violet A2R	Mz	WGS, SS
Fast Acid Violet B, BE	Mz	WGS, SS
Fast Acid Violet 10B	By	WGS
Fast Acid Violet R, RBE, RGE	Mz	WGS, WCh
Fast Azo Garnet Base	Mz	Printing
Fast Azo Grenat	Mz	WGS
Fast Black B, BS	B	Sulphur

Year-Book for Colorists and Dyers

Name of Dye.	Agent or Maker.	Dye Method.
Fast Black D	Sch	CD
Fast Blue	Mz, Brs	WGS
Fast Blue B for wool	Mz, A, PK	WGS
Fast Blue for Cotton, B, 3B, 3R	Kell	CT
Fast Blue for Cotton, B, 2B, 3B, 4B, 5B, 6B	Mz	CT
Fast Blue for Cotton, B, B2, BR2	A	CT
Fast Blue for Cotton R, 2R, 3R, RB	Mz	CT
Fast Blue for Cotton, TAI, TAIH	Mz	CT
Fast Blue 2B for Cotton	A, NI, SS	CT
Fast Blue 5B greenish	Mz	WGS
Fast Blue B, BA, 3B, 6B, for wool	A	WGS
Fast Blue 6B for wool	A	WGS
Fast Blue BN	Math	WGS
Fast Blue BBH	L	CT
Fast Blue Black paste	Mz	CT
Fast Blue Black M paste	Mz	CT
Fast Blue C	Jr.	
Fast Blue D	Mz	WGS
Fast Blue EL	O.	
Fast Blue E, E000	O	WGS
Fast Blue extra greenish	Mz	WGS
Fast Blue FS	Mz	WGS
Fast Blue G	Bd, Bi	WGS
Fast Blue G extra	Mz	WGS
Fast Blue greenish	Mz, PK	WGS
Fast Blue 6G	Math	WGS
Fast Blue N	Sch	WGS
Fast Blue NG, NR	O	WGS
Fast Blue O, OO	Mz, Klp	WGS
Fast Blue OOO	O	WGS
Fast Blue BRG for cotton	A	CT
Fast Blue 3R for cotton crystals	Mz	CT

Dyestuffs, Makers, and Methods

Name of Dye.	Agent or Maker.	Dye Method.
Fast Blue R	Mz, A, Math, PK..	WGS
Fast Blue R, RA for wool	A	WGS
Fast Blue 2R, 3R, 5R, No. 60	Mz	WGS
Fast Blue, RD, RRD	Math	WGS
Fast Blue III R	S	CT
Fast Bordeaux O	Mz	WCh
Fast Brown	Mz	WGS
Fast Brown 3B, G	A	WGS
Fast Brown N	PK	WGS
Fast Brown ONT yellowish	Mz	WGS, SS
Fast Brown R	Mz, Pk	CD
Fast Brown 25	A	WGS
Fast Chrome Black L, M	H	WACH
Fast Claret	HS, Klp	WGS
Fast Claret Red O	Mz	WGS, SS
Fast Cotton Blue B, 3B, R, RR, 3R ...	Mz	CT
Fast Cotton Brown R	Kell	CD
Fast Cotton Orange 6R extra	Bs	CD
Fast Cotton Yellow 10G	Mz	WG, SA, CT
Fast Dark Blue B	Mz	WGS
Fast Diamine Yellow ARR	Bs	CD
Fast Direct Blue	Mhy	CD
Fast Direct Blue G	Bt	CD
Fast Direct Brown BB, G	Bs	CD
Fast Fulling Blue RR	Bs	CD
Fast Gray B, R	Klp	WCh
Fast Green	O	CT
Fast Green No. 12 paste	Mz	WCh
Fast Green No. 16	Mz	WCh
Fast Green Crystals O	Mz	WCh
Fast Green extra, extra bluish	By	WGS
Fast Green B, CR	By	WGS
Fast Green B	Math	WGS

Year-Book for Colorists and Dyers

Name of Dye.	Agent or Maker.	Dye Method.
Fast Green CR	Bs	WACH
Fast Green M, SS.....	By	WGS
Fast Indigo Blue R	Klp	Printing
Fast Light Green	K	WGS
Fast Light Orange G	By	WGS
Fast Light Yellow, G, 3G	By	WGS
Fast Milling Red G	Lev	WCh
Fast Mordant Yellow G	By	WGS
Fast Navy Blue A, G	PK	CT
Fast Navy Blue GM	O	CT
Fast Navy Blue M	K	WGS
Fast Navy Blue RA	K	CT
Fast Navy Blue RM	O	CT
Fast Navy Blue RN	K	CT
Fast Neutral Violet B	O	CT
Fast New Blue for Cotton	Math	CT
Fast Orange O	Mz	Lakes
Fast Pink B	At	WGS
Fast Pink for Silk	Klp	CD
Fast Ponceau B, 2B	Klp.	
Fast Red	Mz, CDC, A, Klp...	WGS
Fast Red A	A, By, K, O, PK ..	WGS
Fast Red B	NI, PK	WGS
Fast Red BT	By, Klp	WGS
Fast Red C	PK	WGS
Fast Red D	O, PK	WGS
Fast Red E	By, PK	WGS
Fast Red E, B	PK, Bs	WGS, SS
Fast Red extra	Kell	WGS, SS
Fast Red 7B	NI.	
Fast Red NS	By	WGS, SS
Fast Red O	Mz	WGS
Fast Red R	AC	WGS

Dyestuffs, Makers, and Methods

Name of Dye.	Agent or Maker.	Dye Method.
Fast Red RC	Sch	WGS
Fast Red RR, RY	PK	WGS
Fast Red S	Mz	WGS, SS
Fast Scarlet, B	K	WGS
Fast Silk Gray O	Mz	SS
Fast Sulphon Violet 4R, 5BS	S	WGS
Fast Violet	Klp	WCh
Fast Violet B	Mz	WCh
Fast Violet bluish, reddish	By	WGS
Fast Wool Blue A	A	WGS
Fast Yellow	BrS, By, Math, PK,	WGS
Fast Yellow G	Th	CD
Fast Yellow greenish	Bs	WGS
Fast Yellow M	BL	WGS
Fast Yellow R	K	WGS
Fast Yellow S	Mz, Math	WGS
Fast Yellow 4S	SS	WGS
Fast Yellow TS	Mz	CD
Fast Yellow, 1, 2	Sch	CD
Fast Yellow 272	Sch	WGS
Fat Ponceau	Mz.	
Filling Blue	Klp	WCh
Fine New Green Crystals	Bt.	
Fine Violet	Bt.	
Firn Blue	Klp	WGS, SS, CT
Flavanthrene G, R	B	Printing
Flavazine S, L, T	Mz	WGS
Flavazol	A	WGS
Flavinduline	PK	CT
Flavophosphine, G conc., new, 2G conc., new, 4G conc., new, R conc., new	Mz	CT

Year-Book for Colorists and Dyers

Name of Dye.	Agent or Maker.	Dye Method.
Flavophosphine, GO new, 2GO new, 4GO		
new, RPO new, GCO new	Mz	Leather
Florida Red, B, G	L	WGS
Fluoresceine	Mz, Klp, Math, PK ...	
Fluoresceine G, R, 6836	Math	WGS, SS
Fluorescent Blue	Klp, SS.	
Formyl Blue B	Math	WGS
Formyl Violet 4B, 6B, 8B, 10B, S4B,		
S5B	Math	WGS
Fram Blue G	By	WGS
Fuchsine	Mz, P, By, Klp, Math, O, PK, NI, PS	WG, SS, CT
Fuchsine A	SS	WG, SS
Fuchsine Crystals 685	Sch	WG, CT
Fuchsine FCOOB	Math	WG, SS
Fuchsine S	Mz	WGS, SS, CT
Full Blue O	Klp	WCh
Fulling Black	K	WCh
Fulling Blue	Kell	WGS
Fulling Blue G, R	Mz, Bs	WGS
Fulling Blue JB	Mz	CDv
Fulling Brown JB, JR	Mz	CDv
Fulling Green	At	
Fulling Green JB, JG	Mz	CDv
Fulling Green	Mz, At	WGS
Fulling Red B	Math	WGS
Fulling Red B, FGG, FR. G	Bs.	
Fulling Red JB	Mz	CDv
Fulling Red R	Bs	WCh
Fulling Yellow	Mz	WGS
Fulling Yellow JG, JR	Mz	CDv
Fulling Yellow O	Math	WGS

Dyestuffs, Makers, and Methods

Name of Dye.	Agent or Maker.	Dye Method.
Fulling Yellow OO	By, Kell	WCh
Gallamine Blue	Kell	WCh
Gallanil Green	Klp	WCh
Gallanil Indigo P, PS	Klp	WCh
Gallanil Violet	Klp	WCh
Gallazin A	DH	WCh
Gallein A paste, R paste, W powder ...	Mz, By, PK	WCh
Gallein paste	Mz	WCh
Gallocyanine BS, DH	Mz, By, PK	WCh
Gallocyanine paste	H.	
Gallocyanine paste D	A, K	WCh
Gambine	H	WCh
Gambine B, G, R, Y, YDS, Yellow	H	WCh
Garnet	HS	WGS
Garnet 71031	AC	WCh
Geneva Blue, C, RR	AC	WCh
Geneva Brown	A.	
Gentian Blue 6R	Kell	CT
Gentianin	Kell	WGS, CT
Geranium GN	By	WN, CT
Geranine BB, G	Mz, By	CD
Germania Red	Klp	CT
Giroflé	DH	CT
Glacier Blue	Klp	WGS, SS, CT
Glaucol G	L	WGS
Gloria Black B	Math	WSA
Glycine Blue, Corinth, Red	Ki	CD
Golden Brown	BL	CD
Golden Yellow	H	WGS
Gold Orange	Bs, By	WGS, CT
Gold Orange for Cotton	Klp.	
Gold S, C	Sch	CD
Gold Yellow	By	WGS, SS

Year-Book for Colorists and Dyers

Name of Dye.	Agent or Maker.	Dye Method.
Gold 83	Gt	CD
Gray B, R	Klp.	
Green resinate A	Math.	
Grenadine	Mz, NI	WG, SA, CT
Grenadine B, BB, G	O.	
Grenat S	PK.	
Guernsey Blue	Mz, O.	
Guinea Bordeaux B	A	WGS
Guinea Carmine B	A	WGS
Guinea Fast Green B	A	WGS
Guinea Green B, G, B extra	A	WGS
Guinea Red 4R	A	WGS
Guinea Violet 4B	A	WGS
Half Wool Black B, T	O	CWD
Half Wool Black BN, 2BN, 4BN, 2BNI. B	B	CWD
Half Wool Black LS	By	CWD
Half Wool Black S	Math	CWD
Half Wool Blue B	Mz	CWD
Half Wool Blue G	Math	CWD
Half Wool Black S	Math	CWD
Hat Black FC, MC	Math	WGS
Havanna RF VB	Math	CT
Havanna Black TED	AC	CD
Havanna Blue DR, W	AC	CD
Havanna Brown CBB, O, No. 50, No. 61, B, YY	AC	CD
Helianthine	Kell, PK	WGS, SS
Heligoland Blue B, G, GA, GG, R, 2R ..	Jy	CD
Heligoland Brown	NI	CD
Heligoland Red	NI	CD
Heligoland Yellow	NI	CD
Helio-Orange GL, RL	By	Lakes
Helio Purpurine 4BL, 7BL, GL	By	Lakes

Dyestuffs, Makers, and Methods

Name of Dye.	Agent or Maker.	Dye Method.
Heliotrope	Mz, A, By	CD
Heliotrope Tannin	Math	CT
Heliotrope B	Mz, A, By, K	CD
Heliotrope 2B	Mz, A, By, K	CD
Helvetia Blue	Kell	WGS, CT
Hessian Acid Red L	L	CD
Helvetia Green	Bs.	
Hessian Bordeaux	Mz	CD
Hessian Brilliant Purple	Mz, A, By	CD
Hessian Brown, BB, MM	Bs	CD
Hessian Orange	L	CD
Hessian Purple, B, D, N	Mz, A, By	CD
Hessian Violet	Mz, A, By	CD
Hessian Yellow	Mz, A, By	CD
Hoechst New Blue	Mz	WGS
Hofmann's Violet	KB	WG, SS, CT
Hofmann's Violet N	SS	CT
Homophosphine G	L	CT
Hydrazine Yellow O	O	WGS
Hydroleine Induline, Marine R, Primul. RE		
Immedial Black FF extra, G extra, NV extra, NB, NG, 2 extra, BF conc., NBB, NN conc., NNR, NNG	Math	Sulphur
Immedial Blue	Math	Sulphur
Immedial Blue C	Math	Sulphur
Immedial Bordeaux G conc.	Math	Sulphur
Immedial Brilliant Black B	Math	Sulphur
Immedial Bronze S	Math	Sulphur
Immedial Brown B, 2R	Math	Sulphur
Immedial Catechu	Math	Sulphur
Immedial Dark Brown A. D conc.	Math	Sulphur
Immedial Dark Green B	Math	Sulphur
Immedial Direct Blue B, OD, JB	Math	Sulphur

Year-Book for Colorists and Dyers

Name of Dye.	Agent or Maker.	Dye Method.
Immedial Indone R, RB conc., RG conc., RR conc., BF conc., 2BF conc.	Math	Sulphur
Immedial Maroon B conc.	Math	Sulphur
Immedial Olive B	Math	Sulphur
Immedial Orange C	Math	Sulphur
Immedial Sky Blue	Math	Sulphur
Immedial Yellow D	Math	Sulphur
Imperial Black	At	WGS
Imperial Green Crystals	Bt.	
Imperial Scarlet	By	WGS
Imperial Violet Crystals	At	WGS
Indalizarine	DH	WCh
Indamine Blue N, NB, N extra R	Mz	CT
Indamine Gray	NI.	
Indamine 3R, 6R, TD	NI	CT
Indathrene, C, S, X, CD	B	Printing
Indazine, M, MT, P	Math	CT
Indazurine B, BB, GM, SGM, RM, TS ..	B C F.	CD
Indian Yellow	By	WGS, SS
Indian Yellow G, R, FF	Math	WGS
Indigen Blue BB, R	Klp	CD
Indigene D, F	By.	
Indigo Blue N	Math	WG
Indigo Blue BNK	Klp	CD
Indigo Blue SGN	S S.	
Indigo Blue RB	Math	WGS
Indigo Extract, Synthetic MLB	Mz	WGS
Indigo MLB	Mz	Vat
Indigo MLBR	Mz	Vat
Indigo MLBRR	Mz	Vat
Indigo Powders 1006	H.	
Indigo Salt T	K	Printing
Indigo Substitute B, BS, pat	Mz	WGS, SS

Dyestuffs, Makers, and Methods

Name of Dye.	Agent or Maker.	Dye Method.
Indigo Synthetic	B, M	Vat
Indigo Synthetic MLB, 20% paste, 100% powder	Mz	Vat
Indigotine A, B	Sch	WGS
Indigotine extra L, No. 150	Math	WGS
Indigotine extra L, and No. 1	Klp	WGS
Indigotine O, Synthetic MLB	Mz	WGS
Indigo Vat MLBI, 2, 3	Mz	Dyeing
Indocyanine B, BF, 2R	A	WA
Indoin Blue BB	B	CT
Indo Blue 2B, 2R	By	CT
Indophenol White paste	Klp.	
Indophor	PK.	
Induline	Mz, Bs, By, Math, PK	
Induline B	K.	
Induline BE	SS.	
Induline 6B	A.	
Induline B, R powder	Mz	Printing
Induline NN, JS	PK.	
Induline 2N, 2N greenish, S V	Mz	WGS, SS
Induline R	K.	
Induline Red	SS	WGS
Induline Scarlet	PK	CT
Indumen Blue B	AC	WCh
Ingrain Black	H	CDv
Intense Blue	By	WGS
Iodine Eosine	Mo.	
Irisamine G	Math	CT
Iris Blue	PK.	
Iris Violet	PK.	
Iso Diphenyl Black B, BB, R	Kell	CD
Iso Rubin	A	WGS, SS, CT
Italian Green	ClCo	CD

Year-Book for Colorists and Dyers

Name of Dye.	Agent or Maker.	Dye Method.
Janus Black O, 1, 2	Mz	SA, CDv
Janus Blue B, R	Mz	SA, CDv
Janus Bordeaux B	Mz	CDv
Janus Brown B, R	Mz	SA, CDv
Janus Claret Red B	Mz	CDv
Janus Gray B, BB	Mz	SA, CDv
Janus Green B, G	Mz	SA, CDv
Janus Red B	Mz	SA, CDv
Janus Yellow G, R	Mz	SA, CDv
Jasmine	Kell	WGS, SS
Jet Black R	By	WG, WGS
Jute Black	Mz, Math, O	CT
Jute Black B, 3R	Grie	CT
Jute Black GN	Math	CT
Katigene Black Brown	By	Sulphur
Katigene Black T, SW, 2B, TG, extra, SWR extra	By	Sulphur
Katigene Blue B	By	Sulphur
Katigene Blue Black B, 4B, R, NB ex. .	By	Sulphur
Katigene Brilliant Black B	By	Sulphur
Katigene Brown 2R	By	Sulphur
Katigene Chrome Blue SG, 5G, 2R	By	Sulphur
Katigene Chrome Brown, 5G	By	Sulphur
Katigene Green 2 Bex, 4B, 2G	By	Sulphur
Katigene Indigo B, R, ext, RL, ext CL extra	By	Sulphur
Katigene Khaki G, ext	By	Sulphur
Katigene Olive, G, GN	By	Sulphur
Katigene Red Brown R	By	Sulphur
Katigene Yellow Brown R, GR, ext	By	Sulphur
Katigene Yellow G	By	Sulphur
Kermesine Orange	Mz	WGS
Ketone Blue 4BN, G, R	Mz	WGS, SS

Dyestuffs, Makers, and Methods

Name of Dye.	Agent or Maker.	Dye Method.
Ketone Green NN	Klp	WGS
Kiamensi Orange G, RR	At	CD
Kiton Blue	Klp	WGS
Kiton Green	Klp	WGS
Kiton Red S	Klp	WGS
Klondike Black 153	HS	CD
Klondike Black Brown	HS	CD
Klondike Blue 51, 71	HS	CD
Klondike Brown B. G, GG, No. 156 ...	HS	CD
Klondike Olive Brown	HS	CD
Klondike Orange RR	HS	CD
Klondike Red	HS	CD
Klondike Yellow GG, 3G, No. 162	HS	CD
Kresotine Yellow G, R	A, By, O	CD
Kresol Red	PK.	
Kryogene Black B, BA, G	PK	Sulphur
Kryogene Blue R	PK	Sulphur
Kryogene Brown B, G.....	PK	Sulphur
Kryogene Olive	PK	Sulphur
Kryogene Yellow R, G	PK	Sulphur
Lake Red C	Mz	Lakes
Lake Scarlet FR, FRR, FRRR, GG, 2R, 3R	Math	WGS
Lake Scarlet, GRII, GRCL, RL, 2RL, 2RCL, 3RCL, 3291	Mz	WGS
Lanafuchsine SB, SG, 6B	Math	WGS
Laundry Blue B, 1, 2, 3	Math	WGS, SS, CT
Lazuline Blue	By	WGS
Leather Black New	Math.	
Leather Black C	Mz	Chrome
Leather Black T	Mz	Tannin
Leather Black TB, TG	Math	Tannin
Leather Brown	Mz, O	Tannin

Year-Book for Colorists and Dyers

Name of Dye.	Agent or Maker.	Dye Method.
Leather Yellow	Mz, Bs, Klp	....Tannin
Leather Yellow G, GG	Mz	....Tannin
Light Blue	SS, tM.	
Light Green	KB.	
Light Green SF, bluish, yellowish	PK	....WGS, SS
Lithol Red	PK	....Lakes
London Blue, extra	Br S	....WGS, CAI
Luzon Black	At	....WGS
Lyons Black	FGB	....WGS
Lyons Blue O, R, RR	Mz.	
Madison Blue V	At	....C D & C Dv
Madras Blue B	At, FTM.	
Madras Blue G	SS	....WGS
Madras Blue RR	At	....WGS
Magdala Red	Mz, Klp	....SA
Magenta	H, Math, Sch,	WG, SA, CT
Magenta Extra Large Crystals, extra yellow, Large Crystals, Small Crystals, Double Refined	Mz	....WG, SA, CT
Magenta Large Crystals B	Math	....WG, SA, CT
Magenta I	Klp	....WG, SA, CT
Magenta Crystals 80408	RH	....CT
Malachite Green	A, K, Klp, Math	....WN, SA, CT
Malachite Green B	Mz, P, K	....WN, SA, CT
Malachite Green BB, 4B	Mz	....WN, SA, CT
Malachite Green Crystals	Mz	....WN, SA, CT
Malachite Green G	P K	....WN, SA, CT
Malachite Green Ia	Mz	....WN, SA, CT
Malachite Green Superior	Mz	....WN, SA, CT
Malachite Green No. 12	Mz	....WN, SA, CT
Malachite Green Powder	Mz	....WN, SA, CT

Dyestuffs, Makers, and Methods

Name of Dye.	Agent or Maker.	Dye Method.
Malta Blue	SS	CT
Malta Gray, J	SS	CT
Malta Yellow AL	SS	CT
Manchester Brown, EE, PS	Math	CT
Manchester Yellow	Lev, RD	WGS
Manhattan Black BS	A C.	
Manila Brown, M15G	Sch	CD
Mandarine G extra, GR	A	WGS
Mandarine Orange G, extra	Mz	WGS
Marine Blue BI, 2RX, RI	Mz	WN, SA, CT
Marine Blue HHI	L	WGS
Marinol Acid Blue R	H	WGS
Marion Red	Mz	Lakes
Maroon S	Mz, PK	WGS, SS
Mars Red G	PK	
Martial Black B	SS.	
Martius Yellow	Mz.	
Mauve	SS	SS
Mazarine Blue B, BG, RNS	AC	WCh
Mazarine Brown WO	AC	WCh
Mekon Yellow G, R	Klp	CD
Melanogen G, T	Mz	Sulphur
Melanogen Black G, T	Mz	Sulphur
Melanogen Blue B, BG	Mz	Sulphur
Melantherin JH	Klp	CD
Melanthrene B paste	B	Vat
Meldolas Blue	Math	CT
Melita Blue 6G	L	WGS
Melogen BH	S	CDv
Mercaptol Black	SS	Sulphur
Mercerine Wool Red 10B, G, Y	H	WA
Mercerol Wool Yellow R	H	WA
Meridian Green B	At	CD

Year-Book for Colorists and Dyers

Name of Dye.	Agent or Maker.	Dye Method.
Meridian Violet 51	At	CD
Meridian Yellow 000	At	CD
Merino Blue, R	SS.	
Merino Brown	SS.	
Merino Yellow	SS.	
Metachrome Bordeaux	A	Special
Metachrome Brown B	A	Special
Metachrome Mordant	A	Special
Metachrome Orange R double	A	Special
Metachrome Yellow RD, 2RD, D	A	Special
Metamine Blue B, G	Klp	CT
Metanil Red 3B, 3B extra	By	WGS
Metanil Yellow	Mz, A, Bs, By. K. Kell O, Math, PK	WGS
Metaphenylene Blue B, BB	Math	WGS
Metaphenyl Yellow ME	SS	WGS
Methyl Alkali Blue	Mz, K, Kell, Klp, O, PK.	
Methyl Blue	Math, tM	SS, CT
Methyl Blue for Cotton	Mz, O	WGS, SS, CA
Methyl Blue for Silk	Mz, O	SS
Methyl Blue New	Kell.	
Methyl Blue GS	Math.	
Methyl Cotton Blue	Kell	CA
Methyl Diphenylamine Blue	Mz.	
Methylene Blue B	Mz, Kell, O, PK	WN, SA, CT
Methylene Blue B conc.	Mz	WN, SS, CT
Methylene Blue BB	Mz. Sch, A.	WN, SS, CT
Methylene Blue BB conc.	Mz, PK	WN, SS, CT
Methylene Blue BB crystals	CR	WN, SS, CT
Methylene Blue BB, extra	Mz	WN, SS, CT
Methylene Blue powder extra	A, PK	WN, SS, CT
Methylene Blue B, G, B, H	PK	WN, SS, CT

Dyestuffs, Makers, and Methods

Name of Dye.	Agent or Maker.	Dye Method.
Methylene Blue crystal, chem. pure	Mz	WN, SS, CT
Methylene Blue D, DB, DBB extra, DBB conc., DBB extra conc.	Mz	WN, SS, CT
Methylene Blue D, pure	O	WN, SS, CT
Methylene Blue G	Math	WN, SS, CT
Methylene Blue 4BEE	SS	CT
Methylene Blue 4BEESL	SS	Printing
Methylene Blue RR	O	WN, SS, CT
Methylene Blue 3R, 5R, 6R, D3R, D5R .	Mz	WN, SS, CT
Methylene Blue V	Kell	WN, SS, CT
Methylene Blue, Zinc free, pure	Mz	WN, SS, CT
Methylene Dark Blue 3BN, RBN, pat. .	Mz	WN, SS, CT
Methylene Gray B, BF, G, ND, NF, O, R	Mz	WN, SS, CT
Methylene Green	Kell	WN, SS, CT
Methylene Green B	Mz, By	CT
Methylene Green G, GG, O, extra yellow, yellow conc.	Mz	WN, SS, CT
Methylene Heliotrope O	Mz	WN, SS, CT
Methylene Indigo O	Mz	WN, SS, CT
Methylene Violet	SS	WN, SS, CT
Methylene Violet BN, RRA, 3RAext. .	Mz	WN, SS, CT
Methyl Eosine	A, Klp	WN, SS, CT
Methyl Green	A, By, K, Math, SS.	
Methyl Indigo B, R	Mo	Vat
Methylindone B, R	Math	CT
Methyl Violet B, 2B	Mz, A, By, Math, NI, O, PK.	
Methyl Violet 2B, c. p.	Mz	WG SA, CT
Methyl Violet 2BC	Seh	WG, SA, CT
Methyl Violet BO	Math	WG, SA, CT
Methyl Violet 3B	Mz, Math, O.	
Methyl Violet 3BD	Math	WG, SA, CT

Year-Book for Colorists and Dyers

Name of Dye.	Agent or Maker.	Dye Method.
Methyl Violet 3BO	Bch.	
Methyl Violet 4B	Mz, Math, O	WG, SA, CT
Methyl Violet 4BO	Math	WG, SA, CT
Methyl Violet 5B	Mz, Math, O	WG, SA, CT
Methyl Violet 6B	Mz, Math, O	WG, SA, CT
Methyl Violet 6BO	Mz, K, Math, NI, O, SS	WG, SA, CT
Methyl Violet 6B, chem. pure	Mz	WG, SA, CT
Methyl Violet 6B, crystals	Kell, Klp, PK, WG, SA, CT	
Methyl Violet BSC	Math	WG, SA, CT
Methyl Violet extra	Mz	WG, SA, CT
Methyl Violet OB, OBB, O3B, O4B, O5B, O6B, O3R	O	WG, SA, CT
Methyl Violet R, 2R	Mz, Math ..	SW, WG, SA, CT
Methyl Violet 3R, 4R	Mz, Math ..	WG, SA, CT
Methyl Violet 5R	Mz	WG, SA, CT
Methyl Violet RO	Math	WG, SA, CT
Methyl Violet RSJ	Math	WG, SA, CT
Methyl Violet Superior	Mz	WG, SA, CT
Methyl Violet 72 O	Math	WG, SA, CT
Methyl Water Blue	PK	WG, SA, CT
Metol Blue	LBF	CD
Mikado Brown B, 3GA, MG	Mz, Bs	CD
Mikado Gold Yellow, 2G, 4G, 6G, 8G ...	Mz, Bs	CD
Mikado Orange G, R, 2R, 3R, 4R, 5R ..	Mz, Bs	CD
Mikado Yellow, 2G, 4G, 6G	Mz, Bs	CD
Milling Blue 2 Rex	Mz	WGS, WGSch
Milling Blue 85	HS	WGS

Dyestuffs, Makers, and Methods

Name of Dye.	Agent or Maker.	Dye Method.
Milling Green B	NYB	WGS
Milling Orange	D	WCh
Milling Red E	SS	WGS
Milling Red FFG, FR, G, R	Math	WGS
Milling Red 82	HS	WGS
Milling Scarlet 4R conc., 4 RO	Mz	WA, WACH
Milling Yellow 11, O, OO	Math	WGS
Milling Yellow 55	SS	WGS
Milling Yellow 84	HS	WGS
Milling Yellow R	L	WGSCh
Mimosa, YC	Kell	CD
Moline	At	WCh
Montana Brown 3G, M	L	CD
Mordant Yellow G, 3R	PK	WCh
Mordant Yellow O, R	Mz	WCh
Muscarine	Klp	CT
Nacearat	SS	WGS
Nako Black O	Mz	Fur
Nako Brown D, P	Mz	Fur
Nako Red O	Mz	Fur
Nako Yellow O	Mz	Fur
Naphthalene Acid Black S	By	WGS
Naphthalene Black 2B, D	H	WGS
Naphthalene Blue B, 5G	Mz	WGS
Naphthalene Green conc., V	Mz	WGS
Naphthaline Pink or Scarlet, see Mag- dala Red		
Naphthaline Yellow	Mz, Bs, Math	WGS
Naphthamine Blue 2B, 5B, BR, 2R, 3R. K	K	CD
Naphthamine Blue BE, GE	K	CDv
Naphthamine Brown 2B, 6B, R, N, 8B, RB	K	CD
Naphthamine Dark Blue R	K	CD

Year-Book for Colorists and Dyers

Name of Dye.	Agent or Maker.	Dye Method.
Naphthamine Direct Black FF	K	CD
Naphthamine Fast Black BE, GE, SE...	K	CDv
Naphthamine Indigo Blue G, 2B, 5B, 2R, RE	K	CD
Naphthazarine Black	B	WCh
Naphthazarine Blue	Bs	WGS
Naphthazarine Blue B	O	WGS
Naphthazarine Blue O	Bs	WGS
Naphthazarine R, S, B, BE, RE	O.	
Naphthine Brown	SS	WCh
Naphthion Red, see Orseille Substitute V		
Naphthine S	SS.	
Naphthoacetine Fast Black	Sch	WCh
Naphthocyanine	EP.	
Naphthogen Blue 2R, 4R	A	CDv
Naphthol S	Math.	
Naphtho Rubine	By	WGS
Naphthol Black B, BDF	Math	Printing
Naphthol Black BB, 3B, 4B, 6B, 12B...	Math	WGS
Naphthol Black 4BA	H	WGS
Naphthol Black D	Mz	WGS
Naphthol Black P, NY, SG, 4R	Math	WGS
Naphthol Blue B, D	RE	WGS
Naphthol Blue 2B	PK	WGS
Naphthol Blue G, R	Math	WGS
Naphthol Blue Black A	Math	WGS
Naphthol Brown 193	HS	WGS
Naphthol Green B, OO	Math	WGS
Naphthol Orange	A	WGS
Naphthol Red	SB	WGS
Naphthol Red C	Math	WGS
Naphthol Red O	Mz	WGS

Dyestuffs, Makers, and Methods

Name of Dye.	Agent or Maker.	Dye Method.
Naphthol Red S, GR	PK	WGS
Naphthol Yellow	Klp	WGS
Naphthol Yellow S	Mz, By, Klp, Math, O PK	WGS
Naphthol Yellow SE	Mz	WGS, SS
Naphthalene Yellow	Math.	
Naphthylamine Black 4BK	By	WA
Naphthylamine Black 6BD	Math	WGS
Naphthylamine Brown	PK	WGS
Naphthylamine Pink	Klp	WGS
Naphthylamine Yellow	K	WGS
Naphthyl Blue	K	WGS
Naphthyl Blue 2B	PK	CD
Naphthyl Blue Black MNY, N, R, SB, S2B, S3B, FBB, FB	Math	WGS
Naphthyl Violet	K.	
Naphthylene Blue R, crystals	By.	
Naphthylene Red	By	CD
Narceine	Klp.	
Navy Blue B	A C, Klp	WGS
Navy Blue BW, H	Klp	WGS
Navy Blue Double cone., DR	O	CT
Navy Blue B, R	Mz	Printing
Navy Blue V	Mz	WGS, SS, CT
Neptune Green S, SG	PK.	
Neptune Green 6O	HIS	WGS
Nerol Black B, BB, 2G new, 4B, 2BG, 4BG	A	WA
Nerol Blue Black	A	WA
Nerogene D	A	Developer
Neutral Blue	Math	CT
Neutral Blue R, 3R	Mz	WN, WGS
Neutral Fast Violet B	Math.	

Year-Book for Colorists and Dyers

Name of Dye.	Agent or Maker.	Dye Method.
Neutral Gray G	A.	
Neutral Red extra	Math.	
Neutral Scarlet	Mz	CT
Neutral Violet extra	Math.	
Neutral Violet O	Mz	SA, WN
Neutral Wool Black B, G	Math	WN, WGS
New Acid Green GX, 3BX	By	WGS
New Acridine Orange G	Bs	CT
New Blue B, BF, D, 110, extra F, G, FL, L, O1114A, R, crystal, R pow- der, 72325	Math	CT
New Blue O	Mz	SS, WGS
New Blue R	Bs, By, Math.	
New Coccine	A, Klp.	
New Coccine O	Mz	WGS, SS
New Coccine R	A	WGS
New Cotton Solid Blue	Klp	CT
New Croceine	PK	CD
New Direct Blue B	A	CD
New Ethyl Blue, B, R, BS, RS	Mz	CT
New Fast Belgium Blue F	A C	WCh
New Fast Black	B L.	
New Fast Blue paste, F, H	By.	
New Fast Blue 3R crystals	Mz	CT
New Fast Gray	By	CT
New Fast Green 3B	Klp	CT
New Fuchsine	Klp	WGS, SS, CT
New Gray	By	WGS, CT
New Green	By	WGS, SS, CT
New Green O paste, powder.....	Mz	Printing
New Indigo	Klp	CD
New Magenta	O	WN, WG, SA, CT
New Magenta O	Mz ...	WN, WG, SA, CT

Dyestuffs, Makers, and Methods

Name of Dye.	Agent or Maker.	Dye Method.
New Metamine Blue M	Mz	CT
New Methylene Blue BB, F, GG, N, NX, NF, R, 3R, 70721	Math	CT
New Methylene Blue N	Mz	CT
New Methylene Blue F, FR	By	CT
New Methylene Gray B paste G powder.	Mz	CT
New Patent Black B, E	K	WGAs
New Patent Blue B, 4B, GA	By	WGS
New Patent Silk Blue	By	SS
New Phosphine G	Math	CT
New Red L	K	WGS
New Solid Green BB, 3B	Klp	WGS, SS, CT
New Toluylene Blue B, GG, M, R	O	CD
New Toluylene Brown B, BB, BBO, P ..	O	CD
New Turmerine T	BrS	CD
New Victoria Black B	By.	
New Victoria Black Blue	By.	
New Victoria Blue B	By	WGS, CT
New Victoria Blue GG	Klp	CT
New Victoria Green	By.	
New Yellow	PK	WGS, CT
New Yellow L	K.	
Niagara Blue 6B	Sch	CD
Niagara Direct Black	Sch	CD
Niagara Union Black	Sch	CWD
Nicholson Blue	Br, S, Klp.	
Nicholson Blue B, 2B, 4B, R, 2R, 3R ..	Mz.	
Night Blue	Klp, PK	WGS
Nigramine	Nil	
Nigrogene Orange	PL	WGS
Nigrophor	B	Printing
Nigrosine, J	SS.	
Nigrosine alcohol soluble	Mz, A, Bs, Kell, Math, NI, SS.	

Dyestuffs, Makers, and Methods

Name of Dye.	Agent or Maker.	Dye Method.
Nigrosine crystals, E, 73651	Math.	
Nigrosine water soluble	Mz, A, Bs, Klp, K, Kell, Math.	
Nigrosine water soluble No. 10, No. 12 .	Mz.	
Nigrosine Gray Blue, 1, 2, 3, 4	Mz	WN, SS
Nile Blue A, 2B, NN, R	PK	CT
Nitrazine Yellow	O.	
Nitrazol C	Math.	
Nitrophenine	ClCo	CD, WCh, SA
Nitrosamine Red	PK	CDv
Nitroso Base M 50%	Mz	Printing
Nitroso Blue MRS	Mz	Printing
Non Mordant Cotton Blue	Br. S.	
Nopaline	tM.	
Nyanza Black B	A, Mz	CD
Nubian Black..	HS.	
Oenanthinine	Klp	WGS, SS
Oil Yellow A, B, D	Math.	
Oil Black, Blue, Brown, Green, Orange, Red, Violet	Math.	
Old Scarlet	By	WGS
Oleine	BL.	
Opal Blue	Mz, Br, S, Math.	
Opal Blue superfine, soluble	Mz	WGS, SS, CT
Opaline Black 1602	Bch	CD
Opaline 2G, 5G, R	Gb.	
Oramine Blue R.....	PK	CD
Orange	tM	WGS
Orange Crystals	NYB	WGS
Orange A	Mz, Klp, Math,	WGS, SS
Orange I	Mz, By, K, Klp, Math,	WGS, SS

Year-Book for Colorists and Dyers

Name of Dye.	Agent or Maker.	Dye Method.
Orange II	Mz, Klp, Math, SS,	WGS, SS
Orange III	Klp, Math, SS, WGS, SS	
Orange IV	Mz, Bs, Kell, Klp, PK,	SS .....WGS, SS
Orange ENL, ENZ, extra, 2G	Math	WGS
Orange G	Mz, A, Math, PK, WGS	
Orange GG	Bs, Math.	
Orange GG crystal	Math.	
Orange GRX	PK	WGS
Orange GS	O	WGS
Orange GT, RO	By	WGS
Orange M	Klp	WGS
Orange MG paste	Klp	WGS
Orange MN	Klp	WGS
Orange N	K, Klp, PK	WGS
Orange P	O	WGS
Orange R.....	Mz, Klp, Math, PK,	WGS
Orange RL, RRL, RN		
Orange RR	Math	WGS
Orange TA	Mz	WGS, SS
Orange Y	CDC	WGS
Orange 4	Mz, Math	WGS
Orange 4LL	Mz	WGS, SS
Orelline		
Orehil Crimson powder	PK	WGS
Orehil Substitute G pat.	Mz	WGS
Oriol Yellow	Kell	CD
Oregon Black	AC	CD
Oregon Blue L, U	AC	WGS
Oregon Pink, Red, Yellow	AC	WGS
Orseille Red A	PK	WGS

Year-Book for Colorists and Dyers

Name of Dye.	Agent or Maker.	Dye Method.
Orseille Substitute G	A	WGS
Orseille Substitute N extra	Math	WGS
Orseille Substitute V	A, SS	WGS
Orseille Substitute 3VN	SS	WGS
Orseilline BB	By	WGS
Orseilline B, R	Mz	WGS, SS
Ortho Black 3B	A	WGS
Ortho Cerise B	A	WGS
Ortho Cyanine B, 6G, R	A	WGS
Oxamine Black, BR, MB, MD, MT	PK	CD
Oxamine Blue B, BG, G, BB, BT	F, PK	CD
Oxamine Blue 4B, R	PK	CD
Oxamine Blue 3R, RX, 4R	PK	CD
Oxamine Blue Black BR	PK	CD
Oxamine Maroon	PK	CD
Oxamine Red, B, MT	PK	CD
Oxamine Scarlet B	F.	
Oxamine Violet, BBR, GR, GRF, MT, RR	PK	CD
Oxblood 8851	Bs	CD
Oxy Diamine Black A, AM, AT, B, BG, BM, BZ, BZS, CBS, D, N, NF, NR, S0000, NRT, R, RR, SA, S000, W, FFC extra, FFG, AFF, JE, JEI, JB, JW	Math	CD
Oxy Diamine Blue 3R, G, 3G, 5G	Math	CD
Oxy Diamine Brown RM, RO	Math	CD
Oxy Diamine Orange G, R	Math	CD
Oxy Diamine Violet B, G, R	Math	CD
Oxy Diamine Yellow GG	Math	CD
Oxy Diammogen ED, EF, EN	Math	CDv
Oxydianil Yellow O	Mz	CD

Dyestuffs, Makers, and Methods

Name of Dye.	Agent or Maker.	Dye Method.
Oxyphenine Gold	ClCo.	
Oxyphenine Gold G	HS	CD
Paeonine	Kell.	
Palatine Black 4B	PK	WGS
Palatine Chrome Black	PK	WGSCh
Palatine Chrome Bordeaux	PK	WGSCh
Palatine Chrome Brown	PK	WGSCh
Palatine Chrome Claret	PK	WGSCh
Palatine Chrome Red R, B	PK	WGSCh
Palatine Chrome Violet	PK	WGSCh
Palatine Red	PK	WGS
Palatine Scarlet	PK	WGS
Paper Blues.....	Mz	
Paper Orange OO	Mz	Paper
Paper Scarlet bluish	PK.	
Paper Scarlet Blue and Yellow, 3B, 8086	Mz	Paper
Paper Yellow GGex, Rex.....	By	Paper
Paradiamine Black B	Math	CD
Paramine Brown C, R	CR.	
Paramine Indigo Blue, Navy Blue	CR.	
Paraphenylene Blue R, Violet.....	Bs	CT
Paraphosphine G, R	Math	CT
Paratol Citron	Mz	Lakes
Paratol Chrome Yellow L	Mz	Lakes
Paratol Maroon	Mz	Lakes
Paratol Orange	Mz	Lakes
Paratol Rose	Mz	Lakes
Paratol Red	Mz	Lakes
Paris Violet	SS	CT
Paris Violet 6B, 7B	RE	CT
Parma R paste	S	WCh, CT

Year-Book for Colorists and Dyers

Name of Dye.	Agent or Maker.	Dye Method.
Patent Blue A, AJI, B, G conc., J1, J2, N, L, J3, J0, J00, V, superfine, VG, WS, RL, 2RL	Mz	SS, WGS
Patent Dianil Black FF conc. FFA conc., FFC conc., FFT conc.	Mz	CD
Patent Green O, V	Mz	WGS
Patent Marine Blue LE	Mz	WGS
Patent Orange	A	WGS
Patent Phosphine	Klp	CD
Patent Rock Scarlet.. ..	Br. S	CD
Pecora Black	Sch	CD
Pegu Brown G, DR	Bs	CD
Peri Wool Blue B, G	Math	WGS
Persian Yellow	Kell	WCh
Phenamine Blue B, G, R	PK	WGS
Phenedine Brown. Y, 2Y, 3 Y	SS	CD
Phenedine Brown By, 2By, 3By	SS	CD
Phenedine Orange J	SS	CD
Phenedine Pink JE	SS	CD
Phenedine Yellow 2A	SS	CD
Phenocyanine, B, D	Klp	Printing
Phenocyanine TB, TV, VS	Klp	WCh
Phenol Black SS	By	
Phenol Blue Black 3B	By	WGS
Phenol Flavine	O	
Phenylamine Black 4B, T	By	WA
Phenyl Blue Black N	By	WGS
Phenylene Black	SS	WGS
Phenylene Brown B R	O	CT
Phenylene Red B	SS	SA
Phenylene Violet B, R	SS	WGS
Philadelphia Yellow G	A	CT

Dyestuffs, Makers, and Methods

Name of Dye.	Agent or Maker.	Dye Method.
Phloxine	Mz, Kell, Klp, Math,	WA
Phloxine B, BB	Mz	WA
Phloxine 5B, BA extra, G O, GA ex...	Mz	WA
Phloxine P	P K	WA
Phloxine TA	Mo.	
Phloxine 749	Math.	
Phoenix Red A	Math.	
Phosphine	Mz, Br, S, Kell, Math,	
	NI, PK, SS ...	Tannin
Phosphine 1A, 11A, extra	Math	Tannin
Phosphine N	K	Tannin
Phosphine P, LM, extra	Mz	Tannin
Pigment Brown	PK.	
Pigment Chlorine GG	Mz	Lakes
Pigment Chrome Yellow L	Mz	Lakes
Pigment Fast Yellow G, R	Mz	Lakes
Pigment Orange R	Mz	Lakes
Pigment Purpurine A	Mz	Lakes
Pigment Red B, R	Mz	Lakes
Pigment Scarlet 3B	Mz	Lakes
Pink B R	BL	CD
Pluto Black B, G, R, A, 3B, CR, L conc., TG extra conc., A extra, CF extra, F extra, BS extra	By	CD
Pluto Brown R	By	CD
Pluto Orange G	By	CD
Polychromine B, A	Kell	CDv
Polyphenyl Black, B, G	Kell	WG, WGS
Polyphenyl Black GI, RI	Kell	CD
Polyphenyl Orange R extra	Kell	CD
Ponceau B extra	Mz	WGS
Ponceau BO extra BO, BOG	A	WGS

Year-Book for Colorists and Dyers

Name of Dye.	Agent or Maker.	Dye Method.
Ponceau Brilliant 4R	Math	WGS
Ponceau G	Mz, Math	WGS
Ponceau 2G	Mz, PK	WGS, SS
Ponceau 4GB	A	WGS, SS
Ponceau GR, GR2, GRCL	Mz	WGS, SS
Ponceau J, JJ	Math	WGS, SS
Ponceau R	Mz, A, PK, SS,	WGS, SS
Ponceau 2R, 3R, 2RCL, 3RCL	Mz	WGS, SS
Ponceau 2RS	SS	WGS, SS
Ponceau 3RB	A, PK	WGS, SS
Ponceau 4R	Mz, A, PK	WGS, SS
Ponceau 4RB	A	WGS, SS
Ponceau 5R	Mz	WGS, SS
Ponceau 6R, 6R crystal	Mz, PK	WGS, SS
Ponceau 6RB, 10RB, S extra, SS extra ..	A	WGS, SS
Ponceau YB	Mz	WGS, SS
Prague Alizarine Yellow G, R	Ki	WCh
Primrose	S.	
Primrose, alcohol and water soluble ...	Klp.	
Primula B, R	Mz	WG, SA, CT
Primuline	Mz, BrS, By, HS, K, Kell, Math, PK.	
Printing Black for Wool	PK	Printing
Printing Blue	A.	
Printing Blue B, H paste powder	R, Math.	
Prune, powder	Mz	WCh
Prune pure	Mz, Math	WCh
Pure Blue	Mz, Klp, Math, PK.	
Pure Blue B S J	Klp	WGS, SS
Pure Blue O conc. double conc.	Mz	WGS, SS, CT
Pure Blue extra crystals	O	CT
Pure Blue V C	SS	SA

Dyestuffs, Makers, and Methods

Name of Dye.	Agent or Maker.	Dye Method.
Pure Fast Yellow	Math.	
Pure Soluble Blue	Math.	
Purple Blue O	Mz	WGS, SS, CT
Purpuramine DH	DH	CD
Purpurine paste	BaCo, By, PK.	
Pyramine Orange, Y, 3G	PK	CD
Pyrogene Black BD, B, BN, G, GE, GN, FF	Klp	Sulphur
Pyrogene Blue 2R, RM12, R	Klp	Sulphur
Pyrogene Brown 5G, M, R, V, B, D ...	Klp	Sulphur
Pyrogene Cutch 2G, R, DG, DR	Klp	Sulphur
Pyrogene Direct Blue R, G	Klp	Sulphur
Pyrogene Gray B, G, R	Klp	Sulphur
Pyrogene Green B	Klp	Sulphur
Pyrogene Indigo	Klp	Sulphur
Pyrogene Olive N	Klp	Sulphur
Pyrogene Violet Brown S	Klp	Sulphur
Pyrogene Yellow M	Klp	Sulphur
Pyrol Black B conc. BB extra conc. G conc. X conc., ROO	L	Sulphur
Pyrol Blue Black	L	Sulphur
Pyrol Bronze	L	Sulphur
Pyrol Brown G	L	Sulphur
Pyronine B, G	Mz, Bs ...	WGS, SS, CT
Pyrosine, B, J	Mo	WGS
Pyrotine Orange	Bs	WGS
Pyrotine RRO	Bs	WGS
Quinoline Blue	G	Special
Quinoline Red	A	Special
Quinoline Yellow, Spirit	Mz, A	Special
Quinoline Yellow	Mz, A, By, PK, SS, WGS	
Red B	Math, PK	SW, CD
Red Blue crystals, powder	O	CT

Year-Book for Colorists and Dyers

Name of Dye.	Agent or Maker.	Dye Method.
Red C	PK.	
Red for Lake P	Mz	Lakes
Red 785	AC	WGS
Red Violet RS, 4RS, 5R extra, 5RS ...	PK	WGS, SS, CT
Red. Y, YB, YG, Y2G	Mz	WGS, SS
Regina Purple, Violet	BrS.	
Regina Violet, alcohol. water soluble ..	A	WGS, SS
Resinate Blue A	Math.	
Resinate Green A	Math.	
Resinate Red A	Math.	
Resinate Yellow A	Math.	
Resinate Violet A	Math.	
Resorflavine	B	WCh
Resorcine Blue	Mz	Printing
Resorcine Brown	A	WGS
Resorcine Yellow	A, K	WGS
Resorgyl Yellow	RF	CD
Rheonine A, GD	PK	CT
Rhine Blue BH	Jy	CD
Rhodamine B, B extra, 3B, G, G extra ..	Mz, Klp, PK ..	WA, SA
Rhodamine 3G, 5G	Klp, PK ..	WA, SA, CT
Rhodamine 6G, 5G	Klp, PK ..	WA, SA, CT
Rhodamine 5G	By	WA, SA, CT
Rhodamine extra B, O, R	Klp	WGS, SS
Rhodamine S	Klp, PK ..	WGS, SS
Rhodinduline Red B	By	WGS, SS
Rhodinduline Red G, S	By	WGS, SS
Rhodinduline Violet	By.	
Rhodinduline 2BR, Pink, RIV	HS	WGS
Rhodine 2G, 3G, 12GF	BCF	WA, SA, CT
Rhoduline Blue R, GG extra	By	CT
Rhoduline Pink 4B	By	CT
Rhoduline Pure Blue BB	By	CT

Dyestuffs, Makers, and Methods

Name of Dye.	Agent or Maker.	Dye Method.
Rhoduline Heliotrope	By	CT
Rhoduline Heliotrope 3B	By	CT
Rocelline	Kell, Klp, Math, SS, WGS, SS	
Rocelline N	Mz	WGS, SS
Rock Scarlet YS	BrS.	
Rosanthrene A, B, CB, O, R	Klp	CDv
Rosanthrene Bordeaux	Klp	CDv
Rosazeine O extra B, B extra, 4G	Mz	WA, SA, CT
Rosazine	SS	WGS
Rosafond	RH	CD
Rosazurine, B, BB, G	Mz, By	CD
Rose Bengale	Kell, Math, PK, WA, SA	
Rose Bengale AT	A, PK	WA, SA
Rose Bengale, B, 3B conc., G	Mz	WA, SA
Rose Bengale N	Math	WA, SA
Roseine	BrS.	
Roseline B, G, R	Mz.	
Rosinduline 2B Bluish, G, 2GB	K	WGS
Rosolane B, O, R, T paste	Mz	SA, CT
Rosolane	SS	WGS, SA
Rosophenine	ClCo	CD, WGS, SS
Rosophenine R, ink	ClCo	CD
Rosophenine 4B, 5B, 6B	ClCo	CD
Rosophenine Geranine	ClCo	CD
Roxamine	DH	WGS
Royal Green crystals	Klp.	
Royal Violet R	Mz	CT
Rubidine	KB.	
Rubin, S	A	SA, CT
Ruby small crystals	KB.	
Rubramine	NI	CT
Ruffigallol	PK	WCh

Year-Book for Colorists and Dyers

Name of Dye.	Agent or Maker.	Dye Method.
Russia Red B, G	Mz, Math	CT
Russian Leather Red	Math, O.	
Russian Red B, BB, G, GP, N	O.	
Sabot Brown, or palmetto extract	Nat.	
Safraniline	Kell	WGS, SS, CT
Safranine	Mz, Kell, Klp, Math.	
Safranine AG, AGT extra	K	SA, CT
Safranine AN extra	Mz, Math	SA, CT
Safranine B	SW	SA, CT
Safranine B best	Kell	CT
Safranine B cone.	Mz	CT
Safranine BS	Math	SA, CT
Safranine conc.	Mz	SA, CT
Safranine FB extra	PK	SA, CT
Safranine FF extra No. 0	By	SA, CT
Safranine G	O.	
Safranine G extra	A, Math	SA, CT
Safranine GGF, GGP	Math	SA, CT
Safranine GGS	Mz, Math	SA, CT
Safranine M	O.	
Safranine MN, NY	PK	SA, CT
Safranine NT	Math	SA, CT
Safranine O	Mz, Math	SA, CT
Safranine PK	Math	SA, CT
Safranine Purple	PK	SA, CT
Safranine RS, Resinate	Math	SA, CT
Safranine superfine, bluish, yellowish ..	Kell	SA, CT
Safranine S 150	Math	SA, CT
Safranine T	Math	SA, CT
Safranine Y	BrS, Klp.	
Safrosine	PK	SA, CT
Salacine Black, D, P, PT	K	WGSch
Salacine Brown B	K	WGSch

Dyestuffs, Makers, and Methods

Name of Dye.	Agent or Maker.	Dye Method.
Salicine Red	K	WGSCh
Salicine Yellow, G, 2G	K	CD
Salmon Red	A, NI, PK	CD
Scarlatol B	Mz	Lakes
Scarlet B	Math	
Scarlet B extra	Mz	WGS, SS
Scarlet Cardinal	PS	
Scarlet EC, FR, FRR, FRRR, for cot- ton	Math	CAI
Scarlet G, GG, GL, GR11, GV	Mz	WGS, SS
Scarlet BR	A	WGS, SS
Scarlet GRCL	Mz	WGS
Scarlet NR, NRR	SS	WGS, SS
Scarlet R	Mz, By	WGS, SS
Scarlet RBC	Math	WGS, SS
Scarlet RL	Mz	WGS, SS
Scarlet 2R	Mz, Klp	WGS, SS
Scarlet 2RCL, 3RCL	Mz	WGS
Scarlet RRL	Mz, Math	WGS, SS
Scarlet RVL	Mz	WGS, SS
Scarlet 3R, 3RL, 4R, 5R	Mz	WGS, SS
Scarlet 6R Crystals	Mz	WGS, SS
Scarlet S	Math	WGS, SS
Sea Blue	SS	WGS, CT
Seal Brown G	SS	CD
Serge Blue	O.	
Setocyanine	Kell	SS, CT
Setoglaucine	Kell	SS, CT
Setopaline	Kell	SS, CT
Sevres Blue	S	Printing
Silk Black A	H	SS
Silk Blue	Mz	SS

Year-Book for Colorists and Dyers

Name of Dye.	Agent or Maker.	Dye Method.
Silk Blue extra greenish, J8C, IC, T, 5BNOO, T5B, T3B, TB, TR, TRL ...	O	SS
Silk Gray O	Mz	SA
Silk Induline B	Mz	SS, CT
Silk Scarlet TB	H	SS
Silver Gray N	Math	
Sky Blue	JB	
Smaragd Green	By	
Solamine Blue B, R, FF	A	CD
Solar Black	AT	CD
Solid Blue	O	
Solid Blue BB, BD, BL, DD, RR.....	AT	CD
Solid Blue BD, BRD, 2BD, 3RD, 6G ..	Math	WGS
Solid Blue BL	At	
Solid Blue R	Math	WGS
Solid Blue 3R	Math	WGS
Solid Brown O yellowish, L, NT	Mz	WGS, SS
Solid Green crystals, O, A1, 72780	Math	
Solid Gray S	Math	
Solid Green G	Klp	
Solid Green J	SS	
Solid Green JJ0, O	Klp	WGS SS, CT
Solid Green O paste	Mz	WCh
Solid Violet	Klp	WCh
Solid Yellow N	SS	WGS
Soluble Blue	Mz, Bs, BrS, Math ..	SS
Soluble Blue A1	O	CT
Soluble Blue B	Bch	
Soluble Blue 8B, 10B	BrS	
Soluble Blue Cl, C3	Sch	CT
Soluble Blue, J, M, 00	O	CT
Soluble Blue R	Sch	CT
Soluble Blue BV, 3B	O	CT

Dyestuffs, Makers, and Methods

Name of Dye.	Agent or Maker.	Dye Method.
Soluble Blue R	Mz.	
Soluble Blue 3R	Mz, O	CT
Soluble Blue SV	Mz.	
Soluble Blue XG, XL	BrS.	
Sorbin Red	PK	WGS
Soudan Red I, II, III, G, R	A.	
Soudan Black 1, 2, 3, B, R, 2R	SS	WGS
Soudan Brown	A	CD
St. Denis Black B	SS	Sulphur
St. Denis Red	SS	CD
Stanley Red	ClCo	WGS, SS
Standard Blue, Brown, Cutch Shade, Fast Blue, Fast Brown, Red, Tan, Yellow, Red, Yellow	Me.	
Steresine Gray	H.	
Stilbene Orange 4R	ClCo	CD, SS
Stilbene Red	A.	
Stilbene Yellow G, 6G, 8G, 4G	ClCo	CD, SS
Substantive Pink CR	PK	CD
Sudan I, II, III	A, Jb	Special
Sudan G	A, Jb	Special
Sudan Brown	A, Jb	Special
Sulfamine Brown A, B, D 93	Bs	WCh
Sulfanilin Black B, G	K	Sulphur
Sulfanilin Brown P	K	Sulphur
Sulfogen S, MO	L	Sulphur
Sulphin	PK	CD
Sulpho Black	H	Sulphur
Sulpho Black G, R	By	WGS
Sulpho Cyanine G, 3R, 5R, GR	By	WGS, WCh
Sulpho Cyanine Black B, 2B	By	WGS
Sulpho Green	S	WGS
Sulpho Yellow S	K.	

Year-Book for Colorists and Dyers

Name of Dye.	Agent or Maker.	Dye Method.
Sulphogene Blue M	At	Sulphur
Sulphon Acid Blue B, R. 3R ext G	By	WGS
Sulphon Azurine D	Mz, By	WA, CD
Sulphon Yellow 5G, R	By	WGS
Sulphur Black T, T extra, A	A	Sulphur
Sulphur Black 2B ex, TB ex, 4B	A	Sulphur
Sulphur Black L, N, ST	Mz	Sulphur
Sulphur Blue L, extra	A	Sulphur
Sulphur Bronze	Mz	Sulphur
Sulphur Brown G, 2G	A	Sulphur
Sulphur Brown TBG, TBM	Mz	Sulphur
Sulphur Corinth B	Mz	Sulphur
Sulphur Cutch G, R	A	Sulphur
Sulphur Green G	A	Sulphur
Sulphur Indigo B	A	Sulphur
Sultan Violet	H	CD
Sun Yellow	Mz, A, By, Kell, Klip	CD
Superfine Violet	KB	
Superior Violet	KB	
Superior New Green Crystals	KB	
Swiss Black B, BG, B2G, C, DG, D	SW	
Tabora Black R extra	Mz A	CD
Tannin Brown B	Math	CT
Tannin Heliotrope	Math	CT
Tannin Indigo	Klp.	
Tannin Orange R paste, powder	Math	CT
Tartrazine	Mz, Klp, PK	WGS
Tennyson Red	H.	
Terra Cotta	BL	WGS
Terra Cotta F, NF, NFG, X	Kell	CD
Terra Cotta R	Kell	WCh
Tetranil Brown R cone.	NYB	CD
Tetrazo Blue, 6B, 4R, RW, BX	NYB	CD

Dyestuffs, Makers, and Methods

Name of Dye.	Agent or Maker.	Dye Method.
Tetrazo Brilliant Blue BB, RR, 6B	NYB	CD
Tetrazo Brilliant Green J, GDD	NYB	CD
Tetrazo Cutch Brown	NYB	CD
Tetrazo Dark Brown	NYB	CD
Tetrazo Indigo Blue D	NYB	CD
Tetrazo Lemon Yellow	NYB	CD
Tetrazo Pink B	NYB	CD
Tetrazo Purpurine R	NYB	CD
Tetrazo Sulphur Black, extra, 2B ext, R extra	NYB	Sulphur
Tetrazo Sulphur Brown G, 3R	NYB	Sulphur
Tetrazo Sulphur Indigo B	NYB	Sulphur
Tetrazo Sulphur Yellow		
Tetrazo Yellow CH, R	NYB	CD
Thiamine Yellow	BrS.	
Thiazine Brown G, R	PK	CD
Thiazine Red G, R	PK	CD
Thiazol Yellow, 3G	By, A	SA, CT
Thio Brown 2B, R	Bs	CD
Thio Carmine R paste, powder	Math	WGS, SS
Thio Catechine S, 1, 2, 3, 4	SS	Sulphur
Thio Chromogene	Mz, Bs	CDv
Thio Cyanosine	Mo.	
Thio Flavine S	Math	CD
Thio Flavine T	Math	CT
Thiogen Black D	Grie	Sulphur
Thiogene Black NA, NB, T, BB conc., M conc., MR conc., 4B conc., MM conc.	Mz	Sulphur
Thiogene Blue B	Mz	Sulphur
Thiogene Brown R, G, GG, GC, GR, GRR, S	Mz	Sulphur
Thiogene Coal Black O conc.	Mz	Sulphur

Year-Book for Colorists and Dyers

Name of Dye.	Agent or Maker.	Dye Method.
Thiogene Dark Blue B, BT, BTL.....	Mz	Sulphur
Thiogene Diamond Black B, V	Mz	Sulphur
Thiogene Gold Yellow A conc., AO	Mz	Sulphur
Thiogene Khaki O	Mz	Sulphur
Thiogene Orange OG, R, RG, RR	Mz	Sulphur
Thiogene Violet V	Mz	Sulphur
Thiogene Yellow G, GG	Mz	Sulphur
Thion Black BE, TG	K	Sulphur
Thion Blue B, conc.	K	Sulphur
Thion Blue Black	K	Sulphur
Thion Brown G, R, O	K	Sulphur
Thion Green B	K	Sulphur
Thion Violet Black	K	Sulphur
Thional Black T, TB, TR	S	Sulphur
Thional Bronze	S	Sulphur
Thional Bronze G	S	Sulphur
Thional Dark Brown M	S	Sulphur
Thional Black GTXAS, BC	Lev	Sulphur
Thional Green B, 2B, 2G	Lev	Sulphur
Thionine Blue G0	Mz	WN, SA, CT
Thionine Blue 0, 00, 000	Mz	WN, SA, CT
Thio Orange G	Bs	WGS
Thiophenol Black T extra , 2 B ex, 2 R ex.	Klp	Sulphur
Thio Phloxine	Mo.	
Thio Phosphine J	LP.	
Thio Ruby	Bs	WGS
Thio Vesuvine	Bs	WGS
Thio Yellow G, RM, R	Bs	CD
Titan Black ED	H	CD
Titan Blue B, BBB, S	H	CD
Titan Brown O, R	H	CD
Titan Como G, R, S	H	CD

Dyestuffs, Makers, and Methods

Name of Dye.	Agent or Maker.	Dye Method.
Titan Gold, Gray, Navy Blue, Navy R, Orange N, Pink, Red, Red 6B, Scar- let C, Scarlet CB, Scarlet D, Scarlet S, Sky Blue, Yellow H, Yellow R, Yellow Y	H	CD
Tobacco Brown G, R	Math	CT
Tolan Red I, II, B	K	WGS
Tolamine Green, Violet	Klp	CD
Toledo Blue O	Bs	CD
Toluidine Blue O	A, O, PK	CT
Toluylene Black G	O	CD
Toluylene Blue B, R	O	CD
Toluylene Bordeaux B	O	CD
Toluylene Brown, G, R	O	CD
Toluylene Dark Blue B, R	O	CD
Toluylene Orange R	Mz	CD
Toluylene Orange G, R, RR	O, A	CD
Toluylene Red or Neutral Red	O	CD
Toluylene Yellow, SG	O	CD
Toraline B, a logwood preparation.		
Triamine Black B, BT, MJ	Klp	CD
Tramine Blue BNW, MJ, MNW, TNW ..	Klp	CD
Trianisoline	Mo	CT
Triazol Blue BB	O	CD
Triazol Blue BB, 3R	O	CD
Triazol Brown B, G, GOO	O	CD
Triazol Corinth B	O	CD
Triazol Dark Blue B, 3R	O	CD
Triazol Indigo Blue	O	CD
Triazol Red 6B, 10B	O	CD
Triazol Violet R, B new	O	CD
Trisulphon Blues	S	CD
Trisulphon Browns	S	CD

Year-Book for Colorists and Dyers

Name of Dye.	Agent or Maker.	Dye Method.
Trona Red 3B, 7B, 2G	By	CD
Tropaeoline D, G	Math	CD
Tropaeoline R, Y, RN, RNP	Math	WGS, SS
Tumerine 914	Math	WGS, SS
Turquoise Blue BB, G	By	CT
Tyemond Orange RY	H	WGS
Tyemond Scarlet SJ	H	WA
Tyemond Scarlet Y	H	WGS
Union Black B, BB, S, P, BG, A	Math	CWD
Union Black SM, BS	Mz	CWD
Union Black B, D, G	H	CWD
Union Blue DC, XX	Math	CWD
Union Blue R	A	CWD
Union Green	Sch	CWD
Union Navy Blue	Sch	CWD
Urania Blue, B	Bs	WGS, SS
Uranine	Mz, A, BrS, Math, PK.	
Ursol D, P	Z, A	Fur
Vacanceine Blue, Scarlet	H.	
Vat Red paste, powder	H	CD
Vesuvine B, BB, 3BM, conc., 4GB conc., extra yellow, O, RV, 2RV, 3R, su- perior	Mz	WG, SS, CT
Vesuvine B	PK	WG, SS, CT
Victor Black	At	WGS
Victoria Black B, G, 5G	By	WGS
Victoria Black	Mz	Wool
Victoria Blue B	Mz, Kell, Klp, Math, PK	WG, SS, CT
Victoria Blue BS, alcohol soluble	Klp, PK ..	WG, SS, CT
Victoria Blue R, 4R	Kell, Klp, PK, WGS, SS, CT	
Victoria Green 3B	Klp, PK ..	WGS, SS, CT

Dyestuffs, Makers, and Methods

Name of Dye.	Agent or Maker.	Dye Method.
Victoria Heavy Blue	By	WGS
Victoria Pure Blue	B	WGS
Victoria Rubine G, O	Mz	WGS, SS
Victoria Ruby	Mz	WGS, SS
Victoria Scarlet G, R, 2R, 3R, 4R, 5R, 6R	Mz	WGS, SS
Victoria Violet B, paste	Mz, PK	WCL
Victoria Violet 4BS	Mz, By	WGS
Victoria Violet 8BS, 4BSL	Mz	WGS, SS
Victoria Yellow, A, O	Mz	WGS
Victoria Yellow, conc.	Mz	WGS
Vidal Black S, D	SS	Sulphur
Vidaline Blue, BB, 5B, R, RR	SS	Sulphur
Vidaline Brown B, GG	SS	Sulphur
Vidaline Green	SS	Sulphur
Vigoureux Black I	Mz	Printing
Vigoureux Black S	Math	Printing
Vigoureux Brown B, N, SW, V	Math	Printing
Vigoureux Brown I	Mz	Printing
Vigoureux Gray I	Mz	Printing
Vigoureux Green B	Math	Printing
Vigoureux Red A	Math	Printing
Vigoureux Red I	Mz	Printing
Vigoureux Yellow I	Mz	Printing
Vilal Black	HSV	Sulphur
Violamine B, 3B, G, R, A2R, BE, RGE, RBE	Mz	WGS, SS
Violet APF	SS.	
Violet 5B, 6B	By	CT
Violet R, RR	Mo.	
Violet 7B	KB.	
Violet 0B	AC	WGS
Violet Black	PK.	

Year-Book for Colorists and Dyers

Name of Dye.	Agent or Maker.	Dye Method.
Violet 5R	By	WGS, SS, CT
Violet Blue AP	SS	WGS, SS, CT
Violet C	SS	WGS, SS, CT
Violet 4RN	Klp	WGS, SS, CT
Violet 3S0N	SS	WGS, SS, CT
Violet Resinate A	Math.	
Violet 118	HS	WGS
Vulcan Brown D, G	Klp	Sulphur
Walnut Brown A, B	Math	CT
Water Blue	Mz, By, Kell, Klp, Math, O, PK, Sch.	
Water Blue B	Math	SS, CT
Water Blue 3BA, 2BM, BNW	A	SS, CAL
Water Blue 6 B extra	O	CD
Water Blue BS, R, RB	Math	SS, CT
Water Blue R, RC, 2R, ADR, 4RW, 5RW	A	SS, WGS, CAL
Water Blue L	A	SS, WGS, CAL
Water Blue 00	K	SS, CT
Water Rose B	Klp	WGS, SA
Water Soluble Eosine	Klp	WGS, SS
Wine B	SW	CD
Wood Violet S	PK	WGS
Wool Black	A, PK	WGS
Wool Black B	A, Bs	WGS
Wool Black 4B	A, ACW	WGS
Wool Black 4BF	A	WGS
Wool Black 6B	A, BS	WGS
Wool Black 6BW	A	WGS
Wool Black DG, DN	K	WGS
Wool Black GR	A	WGS
Wool Black WC	At	WGS
Wool Blue AF	Fi	WGS

Dyestuffs, Makers, and Methods

Name of Dye.	Agent or Maker.	Dye Method.
Wool Blue B, 2B, R, 5B	A	WGS
Wool Blue FS	Mz	WN
Wool Blue K	PK	WGS
Wool Blue N, R extra, 5 R, B ex S R ex.	By	WGS
Wool Blue S	PK	WGS
Wool Blue SS	Kell	WGS
Wool Gray	Bs	WGS
Wool Gray, B, B double G, R	Klp	WGS
Wool Green B, BS	By, Klp	WGS
Wool Green S	Klp, PK	WGS
Wool Green SS	Kell	WGS
Wool Induline B	K.	
Wool Jet Black 2B, 3B	A	WGS
Wool Printing Black B	L	Printing
Wool Red B	Math	WGS
Wool Red extra	K	WGSS
Wool Red R, G	PK	WGS
Wool Scarlet 3R	CDC	WGS
Wool Scarlet R, 4R, 37W	Sch	WGS
Wool Yellow	PK	WGS
Xanthine	Mz, Klp	SS
XL Acid Eosine 3B, 5B	H	WGS
XL Blue	H	WGS
XL Navy Blue	H	WGS
XL Red	H	WGS
Xylene Blue BS, VS	S	WGS
Xylidine Orange 5572	Math.	
Xylidine Ponceau, see Ponceau 2R.		
Xylidine Red, see Ponceau, 2R.		
Yellow AT	Math	WGS
Yellow Coralline.		
Yellow Fast to Soap	SS.	
Yellow for Leather, O, 2a, 7, 11, G	Mz	Tannin

Year-Book for Colorists and Dyers

Name of Dye.	Agent or Maker.	Dye Method.
Yellow Resinate A	Math.	
Yellow T	Klp	WGS, SS
Yellow W	By	WGS, SS
Yellow W R	Klp	CD
Yellow 5153, 521	HS	WGS
Yellow II	Math.	
Yellow N	RH.	
Zambesi Black D	A	CD
Zambesi Black B, BR, D, F, FO	A	CDv
Zambesi Black 2G, NA, V	A	CDv
Zambesi Blue B, BX, R, BX	A	CD
Zambesi Brown G, 2G	A	CD
Zambesi Gray B	A	CD
Zambesi Indigo Blue R	A	CD
Zambesi Pure Blue 4B	A	CD



PART VII

Miscellaneous Notes



FARBWERKE vorm. M



STER LUCIUS & BRÜNING. HOECHST a.M.



Dr. Eduard Ullrich.



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THE HOECHST FARBWERKE IN 1904.

In Volume VI. was described the system of the Farbwerke vorm. Meister Lucius & Brüning, in looking after the interest of their employees, and in previous volumes the size of the works at the various times noted. They have grown so that the following figures give some idea of the present size:

Workmen	5000
Overseers	200
Chemists	185
Technical officials	60
The commercial department, excluding salesmen	340

The total ground covered by the works including dwellings for workmen is 341.28 acres.

Corporation buildings under cover, excluding dwellings, 59.82 acres.

Railway track	26.09 miles
Locomotives	18
Steam cranes	4
Wagons	1,060
Steam boilers	118
With heating surface of.....	116,389 sq. ft.
Steam engines	210
Capacity	12,200 h. p.
Electric motors	130
Capacity	2,800 h. p.

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The works are lighted with 370 arc lights and 6000 incandescent lights.

The daily coal consumption is..	662 tons
The daily water consumption is	14,549,350 gallons
The daily gas consumption is..	529,717 cu. ft.
The daily ice consumption is..	750,000 lbs.

OUTPUT.

The total movement in and out by rail is 268,963 tons.

The total movement in and out by water is 319,670 tons.

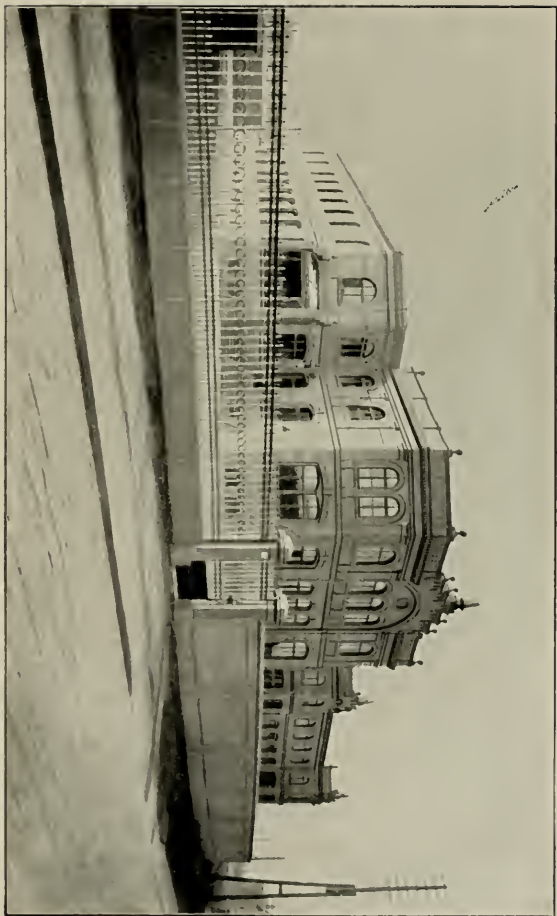
The various beneficial organizations of the Farbwerke have grown so that now the statistics are as follows:

The Kaiser Wilhelm and Augusta	
fund amounts to	1,658,000 marks
The Overseers' Pension Fund	332,000 marks
Pension fund of executive and	
clerical force	1,653,000 marks
The reserve of the department	
sick relief fund is now	142,000 marks
The savings bank deposits amount	
to	668,000 marks

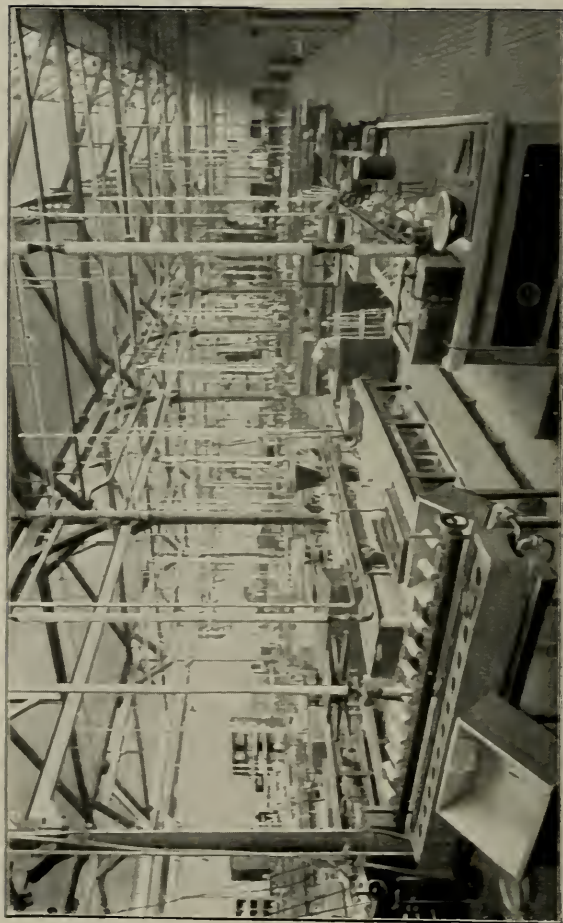
The improvements contemplated have been finished during the past year and the dwellings for workmen and overseers number now 670, besides 50 residences for the official staff.

The dyehouses and printing department are equipped in the best manner possible and on a scale to permit practical work.

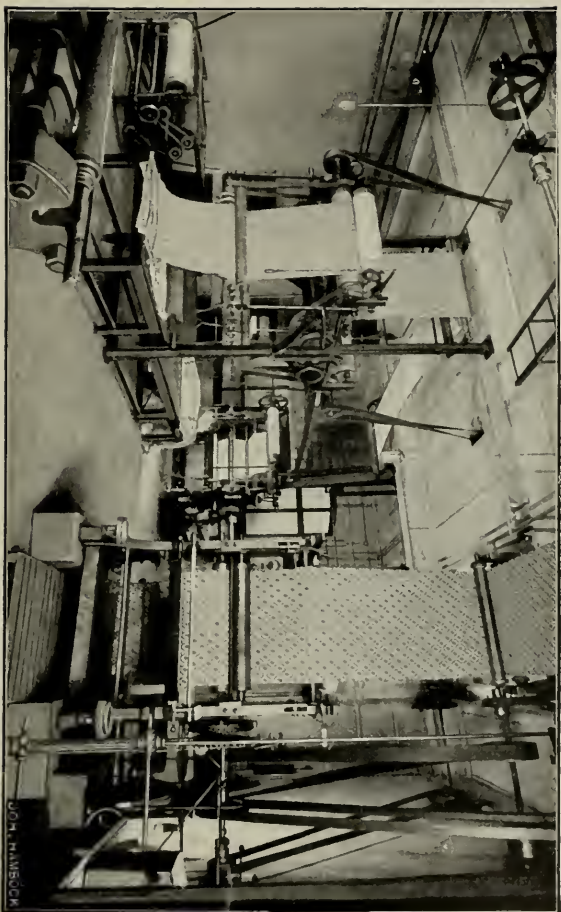
The efficiency of this department, which has been such a great factor in the development of the Hoechst Farbwerke is due to the efforts of Dr. Eduard Ullrich who has been at its head for twenty-five years. In 1903 the Société Industrielle de Mulhouse



Dychehouse.



Dyehouse, interior.



Printing Department.

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showed their appreciation of his attainments and contributions to this branch of applied science by awarding him their medal of honor.

Dr. Ullrich has made several visits to this country, and always receives a hearty welcome from his numerous friends who, many times, have availed themselves of his practical and scientific experience.

The first cut shows a bird's-eye view of the works and following are cuts showing the dyehouse and its interior and the printing department interior.

PHOTOGRAPHY IN CALICO PRINTING.

For some years attempts have been made to photograph patterns upon printing rollers, so as to enable the design to be etched upon the roller, but hitherto with little success. One of the chief difficulties has been to produce a uniform photograph large enough to cover the entire surface of the roller. The differences in the illumination of a large photographic surface have the inevitable consequence of uneven etching of the roller-surface afterwards. This difficulty is now overcome, however, by photographing the design, whether drawn on paper or in an actual fabric, in small portions at a time, and then fitting the different photographs together. Thus the illumination and the other conditions are practically uniform over each portion as it is being photographed, as each is brought in turn into the same position. The negative having been obtained, the picture is transferred to a collodion film. The roller is then coated with a composition sensitive to light and exposed with the film wrapped round it. Those parts of the composition which the film allows to be acted on by the light subsequently resist the etching liquid, which corrodes the roller at the places where the light has not acted. It is said that wall-paper printed with such rollers gives a better imitation of a fabric than when printed in the ordinary way.

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TESTING FABRICS FOR ARTIFICIAL SILK.

One of the surest methods of doing this, whether in mercerized or in unmercerized goods, is to expose them for ten minutes to a dry heat of 200° C. This treatment destroys artificial silk, and makes it crumble away, while it is entirely without action on cotton wool or real silk. If the treated sample is well rubbed when cold, the artificial silk will disappear in dust, and the amount of it originally present can be determined quantitatively by weighing the sample before and after treatment.

IRISH MOSS.

The article known as Irish moss is used in the finishing and sizing of cotton goods as an adhesive and an impartor of fullness, while in calico printing it is occasionally used as a thickening agent. It is the dried fronds of the seaweed known as *Chondrus crispus*, found on many sea coasts of the Northern Seas. In particular, large supplies come from Ireland for various purposes, medicinal and industrial. It is also collected on other coasts, and so it is known by other names—Iceland moss, Carragheen moss, etc.

The weed collectors first of all prepare drying and bleaching beds on a clear, sandy place on the shore. The weed grows on rocks, preferably on those more or less covered by the water, which may be nearly laid bare at low tide; particularly is this the case at the time of spring tides when the ebb is very low, and at that time the most weed is collected. The best grade of weed for medicinal and pharmaceutical purposes is always collected by hand, so that it is free from admixture with other weeds: the bulk is secured by rakes and forks. After being collected the weed is spread out to dry and bleach, an operation whose duration varies according to circumstances. When thoroughly dry the weed is packed and sent to the weed merchants in Dublin or Belfast, who pick and grade it into various grades or qualities.

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Irish weed comes as a foliaceous, crisp product, hard and firm, of a white to gray color, quite tasteless and odorless. When boiled in water it dissolves almost completely, but a few strands of the original weed being undissolved. The liquor which is obtained is rather glairy in character, setting to a jelly on cooling; the liquor is slightly mucilaginous and adhesive. On evaporation, the liquor leaves a dry mass of a tough, firm character, with some amount of elasticity. It is this which makes the Irish moss so valuable for sizing and finishing, for it enables it to give a full feel to cloths, which retain this on account of the saline matters the weed contains. One disadvantage the weed has, and that is the liquor does not keep; it soon ferments, loses its gelatinous character, and evolves a sour odor.

Irish moss and similar weeds are the source of the body known as Algin, which has been found useful for the stiffening and finishing of textiles and for calico printing. (*Textile Colorist.*)

TEST OF ARTIFICIAL SILK.

The Elberfeld, Barmen, silk conditioning house has recently announced the result of numerous tests made to determine the moisture in artificial silk. These tests indicate that the affinity for moisture is practically the same with artificial and natural silk. In several hundred tests of the artificial silk the highest proportion of moisture was 13.99 per cent.; the lowest 9.39 per cent. The greatest variation was thus 4.61 per cent. and the average 11.3 per cent.

On the strength of these tests and in the interests of the silk trade, the conditioning house asked the government for permission to adopt the same standard for artificial as is now provided for natural silk. The government approved of this request and in future the official standard of moisture for artificial silk will be 11 per cent.

The conditioning house has also been authorized to determine

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the net weight, count, twist, elasticity and strength of artificial silk. The fees for this work are to be the same as for natural silk. The determination of the commercial weight of artificial silk is at the same time a test as to its combustibility. Undenitrated artificial silk has but a weak affinity for moisture, 3 to $3\frac{1}{2}$ per cent. The conditioning house will certify to the amount of moisture in silk by percentage.

COTTON.

Sea Island Cotton

is the best grade of cotton in the world; such as raised on the islands off the coast of South Carolina and Georgia or directly on the coast, having a staple of from $1\frac{3}{4}$ to $2\frac{1}{2}$ inches. The fibre closely resembles silk, being extremely fine, strong, and clean, permitting it to be spun readily into 150's and, if required, can be spun up to 400's for ply yarn. Such of this cotton as is grown further away from the coast of Georgia and South Carolina averages from $1\frac{1}{2}$ to 2 inches in length of staple and closely resembles the actual Sea Island cotton, from which it is grown, permitting up to 200's for ply yarn. Florida Sea Island cotton is grown on the mainland of Florida from Sea Island seed. It has a white, glossy, strong fibre, a little coarser than strict Sea Island, varying from $1\frac{1}{4}$ to $1\frac{3}{4}$ inches in length, and is not as carefully handled during cultivation. It is suited for lower grades of Sea Island yarns spun up to 100's and 150's for ply yarn.

American or Mainland Cotton

is the typical cotton of the world grown in what is considered the "mainland cotton belt," which extends from southeast Virginia to Texas, its distribution being mainly between the tide water district and the foothills of the Appalachian mountain system. The deep alluvial soils of the Mississippi valley favor extension of cotton growing much farther northward, from the

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sugar district of southern Louisiana to the southern border of Missouri, including most of Arkansas, and western Tennessee, while the higher elevation of central and eastern Tennessee limits culture and diverts sharply the line of limitation around the foot-hills of northwestern Georgia.

This cotton is suited for all numbers of yarn up to 50's warp and 80's filling, being clean, regular in length of staple, and well graded. On account of these features as well as the fact that the quantity raised is greater than that in all other parts of the world together, the price of American cotton regulates the price of cotton throughout the world.

Of this American cotton, the Gulf (or New Orleans), Benders or Bottom Land varieties are the most important, varying as to length of staple from 1 to $1\frac{3}{8}$ inches ($1\frac{5}{8}$ in special instances), permitting spinning up to 50's warp and 80's filling. Cottons brought into the market as Mobile, Peeles, and Allan seed, belong to the same variety and are next in importance, while Mississippi, Louisiana, Selma, Arkansas, and Memphis cottons, also belonging to this variety, are slightly inferior. Texas cotton varies from $\frac{7}{8}$ to 1 inch in length of staple, and is well suited for warp yarns up to 32's. Next in importance is the Uplands cotton, having a length of staple from $\frac{3}{4}$ to 1 inch, permitting ready spinning into 30's filling. Cottons which are brought into the market under the name of Georgia, Bowed, Norfolk, or Savannah, also belong to the variety of Uplands.

Egyptian Cotton

stands high in the estimation of the commercial world, the success of growing being largely due to the equability of the climate in the delta of the Nile. Of the different varieties grown there, the one known as brown Egyptian is the best, although requiring combing on account of its irregularities of staple. The color itself varies from dark cream to a brown tint, according to soil in which it is grown. The length of its fibre varies from $1\frac{1}{8}$

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to 1½ inches and is spun in 50's to 80's warp, up to 100's for filling and up to 120's for ply yarn. It is not as fine as Sea Island cotton, and of course does not bring so high a price, but is better than our mainland cotton, especially for goods requiring smooth finish and high lustre, at the same time giving to fabrics a soft silk-like finish, a feature which makes this cotton very desirable for use in cotton-mixed silk goods.

Peruvian Cotton.

Peru produces a considerable amount of cotton, three varieties being brought into the market, called respectively, Sea Island, Rough, and Smooth. The "Rough Peruvian" is the only important variety, having a strong, rough, woolly, staple, about 1¼ to 1½ inches long and is usually very clean and well handled. Its chief use is for mixing with wool in the manufacture of Merino yarns, for which reason it is called "vegetable wool," and when carded its resemblance is so close and its characteristics so strikingly similar to wool that it could readily be sold for wool, even to a dealer. When woven into goods along with wool, the cotton fibres can not be determined with any certainty except by using chemical tests. (*Textile World Record.*)

BURLAP FOR DECORATIVE PURPOSES.

This is always dyed in the piece and with colors that will not be acted upon by the glue sizing that is put on the back of the finished fabric. Some manufacturers are using caseine as the burlap size, and with very good results.

Dyeing the piece-goods burlap, a padding machine is always employed, as this enables the dyer to obtain in a very short time the heavy shade usually required. The color bath is made up with a very small quantity of water, or only sufficient to fill the box of the machine, and adding a small amount of some soluble thickening such as dextrine or caseine. This latter product has

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many advantages over any other similar material, and yields very good results on the finished piece.

The "color" is made up in a cask or barrel without any other addition than the thickener, and then poured into the "sow box" or trough of the machine, giving the pieces two runs in opposite directions as to secure shades. The padded goods are well squeezed through nipping rollers and then dried and "backed." The temperature of the color paste should be boiling or nearly so, because the higher the temperature the better the penetration.

Printed patterns or designs are often applied to jute, and the process is exactly the same as for calico work, except that the color paste is made very much thicker, and that the color in a number of instances is not fixed by steaming.

Often white figures are printed upon the dyed burlaps, these being made up of a white pigment, such as blane fixe thickened with albumen or caseine. (*Textile World Record*.)

WEIGHTING SILK.

The depreciation in the European silk trade has continued now for several years and shows no signs of abatement. In fact, reports indicate that conditions are growing worse instead of better. Prices are extremely low and the market is flooded with cheap fabrics which have been made to meet the call for low-priced goods; the poor service which these goods give to the wearer has caused general dissatisfaction on the part of consumers and done much to bring silk fabrics into disrepute.

It is generally admitted by both silk manufacturer and merchant that the depreciation of silk fabrics, particularly the excessive weighting of goods, is a great mistake and a serious menace to the silk industry. There has been much discussion on the subject, but no practical steps have been taken to raise the standard of silk goods until recently when the manufacturers of Como formed an agreement among the dyers of Zurich to limit

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the amount of weighting material in silk goods. No agreement has yet been reached by the trade outside of Como as the fault is general and by no means confined to one particular district. (*Textile World Record.*)

SULPHUR BLACKS IN COTTON WARP DYEING.

This special branch of cotton dyeing has made rapid strides towards greater excellence in results during the past five years than at any previous period, for the reason that with newer methods of dyeing, due to the introduction of greatly improved coloring-matters an incentive was offered for improvements in existing machines. In many mills to-day where sulphur blacks are in use, the old form of warp dyeing machine is still in evidence, due, without doubt, to existing ideas that what was good enough for older dyestuffs should be equally well adapted to the new products.

There can be no question regarding the great improvement of the quality of blacks as dyed upon warps with the sulphur colors in comparison with aniline oil or salt black. At one time there existed, and justly, great opposition to the use of the sulphur blacks on account of the many complaints, more imaginary than real, regarding the destructive action of the dye, etc., upon the fibre, which happily has been exploded by the researches of various investigators.

Other complaints that existed in the early days, and which even appear now from dyers who are adopting the new blacks, were based upon an idea that the shades produced were thin and without any body. These complaints, which accumulated to such an extent as to become really formidable, were found to be wholly due to the use of too little color in the dyebath in proportion to the amount of warp to be dyed. When greater quantities of color were remedied by adding more, the dyer would be dumfounded by the cost of the kettle, so that, on the whole, the

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introduction of the new blacks for warps was not by any means a path of roses.

The objection had to be fought at every detail. The tinctorial weakness of this class of products had to be dwelt upon at considerable length, while the tendering of the warps had to be traced very carefully to its source and strict comparisons made with similar results obtained with aniline.

To-day, on the other hand, there is hardly a warp dyer of any prominence but who is using the sulphur blacks or who would use them if he were not equipped with an extensive aniline dyeing plant. Of course, where a man has been brought up as a dyer of one type of goods, and has worked at it for many years, especially with a process like the aniline black process, it is hard to make a change, but as time goes on, the marked advantage of the sulphur blacks over the aniline process will be more fully realized, and then this historical process will be relegated to the past.

Briefly, the important advantages for warp dyeing of the sulphur blacks over aniline are: no tendering of the threads, nor destruction of the fibre in any way; generally less washing to produce equally clean results; no crocking or bleeding into whites.

The question of cost cannot be settled as it is a purely local factor, and depends upon the quantity of material dyed per day, saving on the part of sulphur blacks due to stronger fibres, etc. It may be regarded, however, all things being equal, the two blacks of equal shade will cost approximately the same.

Equipment for Dyeing Sulphur Blacks.

If the warp is to be after-treated, it is given one passage only. Points that demand attention are absence of copper or bronze fittings in the dye vessels, plenty of steam for boiling, and washing facilities with ample water. With these at hand, the dyer is ready for work. If a small open warp machine is the only apparatus, it may be used by passing the warps through

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two or four times at the boil, squeezing after each end and then washing by a passage through fresh running water.

If the warp is to be after-treated, it is given one passage through a wash water into which a solution of bichromate of potash and acetic acid is allowed to flow. This is better than making two additions, one at each end, where invariably one end (the first and receiving the most chrome), shows a considerable difference in shade from the other.

Where a warp machine of any kind does not exist, an ordinary open kettle provided with a winch may be used. The chain warps are immersed at a boil exactly as yarn, given a few turns over the winch, and then immersed for three-quarters of an hour or so without steam. The washing is done in a separate tub; of course only short warps could be successfully handled in this way.

The ideal warp machine is the three- or four-compartment kettle, three dye compartments communicating, and one (separate) washing compartment, each separated by means of squeeze-rollers. Such a machine should have the top row of rollers a few inches below the level of the dye-liquor. Such a machine is "direct continuous," in that the warps pass completely through the liquor from end to end; a slight modification of it may be termed an "intermittent" dyeing machine, being provided with one or two compartments wherein the warps lie during the dyeing—in other words, the entire warp is completely submerged in the entire volume of dye-liquor, excepting the short portion that is, at the moment, being washed. Such a machine would require about $1\frac{1}{2}$ gallons of water for each 1 pound of warp.

Beamed warps are not dyed in this country, and only in a very few mills in Europe. While the principle is very good, there are at present a few difficulties that have not been overcome, two of the most important being the tendency to uneven shade and lack of thorough penetration. While small warps may be dyed by this process, it is doubtful whether many of the huge beams seen in our American mills will ever be so dyed.

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The best result in warp dyeing with sulphur blacks will always be obtained by working with a boiling bath and keeping the bath alkaline. Where the dye used is soluble in water with or without the assistance of sodium sulphide, it will always be necessary to have present caustic or carbonated alkali in such quantity to maintain the proper degree of alkalinity. Dyeing progresses regularly at the boil or within one or two degrees, consequently the minimum time for dyeing can best be estimated at that temperature. For most blacks, when dyed on yarn, one hour will be found necessary, but for warps, the modification of the conditions demands that the same results are to be obtained from a much shorter immersion, which is accomplished by using a much greater concentration of liquor, a proportionately greater amount of salt, and lapping or folding the warps in basket trucks or boxes so that they shall remain hot as long as possible after each run.

Washing after dyeing should be thorough, the alkalies of the dyebath must be removed, and the excess of dye-liquor at the same time. The old complaints as to the sulphur blacks were invariably due to an excess of salt in the dyebath, thereby partially precipitating the color, and to imperfect washing. By better washing the excess of color is thoroughly removed, and, of course, all tendency to bleed or crock removed. It is now well recognized that where these defects in dyed material are noticed, the trouble can, to a certainty, be traced to this cause and not to the dyestuffs.

A curious case, confirming the above, came under the writer's notice recently, where a red and black check was made with sulphur black dyed warps and filling dyed with the same dyestuff, and woven with para red warp and filling. Upon washing the finished fabric with weak soap, the color appeared to have bled from the black warp, and upon examining the unused portions of both, the warp—due to imperfect washing—was the cause. As a matter of fact, the bleeding was very slight but was sufficient to warrant the pieces being given a thorough soaping.

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An important point to observe in connection with the sulphur blacks is that they should not be allowed to dry until the washing is complete, for it is almost impossible to rewash warps or yarn that have once become dry. (*Textile World Record.*)

TESTS FOR DETERMINATION OF BLACKS ON FIBRE.

Boil a portion of sample in water.

Color bleeds materially	Color does not bleed		
	Developed black	Aniline black	Sulphur black
DIRECT DYESTUFF	Heat a fresh portion with hydrosulphite solution		
	Permanently decolorized	Color returns after washing	
		Aniline black	Sulphur black
		Test with chloride of lime solution 2° Bé. at 190° F.	
DEVELOPED BLACK	Fibre becomes brownish		Fibre decolorized
	ANILINE BLACK		SULPHUR BLACK

NOTE.—Generally all sulphur dyestuffs are soluble in boiling sodium sulphide solutions 10 per cent. strength.



PART VIII

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